COASTAL ZONE CANADA'98

VICTORIA, B.C.
Aug. 30-Sept. 3, 1998

ZONE CÔTIÈRE CANADA'98

VICTORIA, B.C.
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Coastal Challenges:
Sharing Our Experiences-Building Our Knowledge

Défis Côtiers:
Partager notre expérience-Développer nos connaissances

Editors: John D. Pringle, Cynthia A. Wright and Michael W. Dunn

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS 1

INTRODUCTION 1/2
Michael Dunn, President, CZC (BC) Association
John Pringle, Chair, Publishing Committee CZC '98

WELCOME 4
Miles Richardson
Former President of the Council of Haida Nation,
Chief Commissioner, British Columbia Treaty Commission

OPENING ADDRESS 5
The Honourable David Anderson
Minister of Fisheries and Oceans,
Ministry of the Environment, Member of Parliament for Victoria, Government of Canada

TIDES AND TIME: THE POWER OF THE FOURTH DIMENSION
THE RISING VALUE OF TIME IN COASTAL CO-MANAGEMENT 9
Judith Swan
SwanSea Oceans Environment Inc.

CITIES, CONSUMPTION, AND THE COASTAL ZONE 18
William E. Rees
University of British Columbia

CAN INTEGRATION WORK? EVALUATING THE EFFECTIVENESS OF
COASTAL MANAGEMENT 32
Marc Hershman
University of Washington

EVERYTHING I'VE ALWAYS WANTED TO SAY ABOUT THE PREDICTIVE MODELS
USED FOR ENGINEERING DESIGN OF NOURISHED BEACHES. 39
Orrin H. Pilkey
Duke University

IN THE FACE OF DISASTER—SCIENCE FOR PEOPLE AND NATURE 45
Jon Lien
Memorial University of Newfoundland

EMPOWERING COASTAL COMMUNITIES:MORE
PARALYSIS BY ANALYSIS? 54
Carole Donaldson
Participatory Processes Consultant, New Zealand

PIECES OF THE PUZZLE: SOLUTIONS FOR COMMUNITY-BASED FISHERIES MANAGEMENT FROM NATIVE CANADIANS, JAPANESE COOPERATIVES, AND COMMON PROPERTY RESEARCHERS 62
Martin S. Weinstein
University of British Columbia/Consultant, M.S. Weinstein Consulting Service

FOREWORD TO THE PUBLIC FORUM 94
Tom Sampson
Tsartlip First Nation, Saanich Peninsula, British Columbia

A PANEL DISCUSSION: CANADIAN COASTAL ZONE MANAGEMENT IN CANADA: THE FUTURE 97
Jonathan Secter
Secter Environmental Resource Consulting

PERSPECTIVES ON COMMUNITY COASTAL ZONE MANAGEMENT 100
Michael Dunn
Environment Canada

THE NEED FOR SCIENCE IN THE COASTAL ZONE A CASE STUDY: THE RICHIBUCTO ENVIRONMENT AND RESOURCE ENHANCEMENT PROJECT. 107
Simon Courtenay, Andrew Boghen, André St-Hilaire, Barry Jones, Céline Surette, Christine Ouellette, Eric Tremblay, Garfield Barlow, Guy Brun, Harald Rosenthal, Howard Edel, Michael Robinson, Tillmann Benfey, Victorin Mallet

COASTAL ZONE CANADA '98 YOUTH CONFERENCE 115

PLENARY ADDRESS
AN OCEANS VISION 116
Scott Parson, Assistant Deputy Minister Science
Fisheries and Oceans Canada, Ottawa, Canada

CLOSING ADDRESS 121
Miles Richardson
Former President of the Council of Haida Nation,
Chief Commissioner, British Columbia Treaty Commission

COASTAL CHALLENGE TOOLKIT

I. TRAINING AND CAPACITY BUILDING 125
II. COMMUNICATION AND AWARENESS 141
III. EMPOWERMENT 155
IV.FRAMEWORK AND PROCESSES 171
V. KNOWLEDGE 189
VI.POLICY AND PLANNING 203

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INTRODUCTION

Here we are almost two years after CZC '98 and into the new millennium; time for a reflection on the events that happened at the conference as recorded in this volume and our earlier extended abstract volume, *Coastal Communities in the 21st Century: Sharing our Experience—Building our Knowledge.* At the opening of CZC '98 we, the delegates, were likened to a microcosm with all the hopes, values, issues, and knowledge collectively represented by us all. Our goals were integration, shared knowledge and authority, equity among all points of view, and positive interaction among participants. This will surely be required to turn the trends of the latter half of the 20th century to a positive alternative future for our coastal environments.

We celebrated the International Year of the Ocean with a synergy that is uncommon in conferences of this nature. We did, for a brief instance in time, become a cohesive group with a shared vision for a just and sustainable future. Many of us left with renewed vigour to pursue what we had learned and heard at the conference, and to begin applying this in our own context. This energy was tapped several times post-conference to assist in the production of this challenge volume.

While it seems a long time since the conference, and many of you have gone back to your roles and responsibilities, treat this volume as a benchmark for the shared experiences represented by CZC '98. Along with the companion volume provided at the conference, these two documents provide an excellent synopsis of Canadian and international community efforts to integrate ecological, social, and economic factors: to identify the need for the use of science at the community level, and to empower local communities at the twilight of the 20th Century.

In keeping with the Coastal Zone Canada Association's primary goal of providing tangible and relevant experiences for delegates at each of its biennial conferences, the CZC '98 Organizing Committee challenged themselves with developing a venue that would be truly conducive to total community participation. Within this challenge, emphasis was placed on the Youth and First Nations of coastal communities. We totally embraced this challenge in the almost three years of planning that went into the conference. It was to be for coastal communities, by coastal communities, and with coastal communities. We recognized that traditional "expert" conferences tended to be unattractive to local communities because of fear; fear of being too technical, fear of it not being relevant and/or fear of participation. Thus we kept the number of concurrent sessions to a minimum in order to meet the primary needs of the conference: that of close interaction among delegates, and the encouragement of open dialogue and the creative processes that would lead to tangible outcomes. The Organizing Committee worked diligently to provide broad-based information, and to ensure delegates interacted and shared their thoughts, knowledge, and feelings about integrated coastal management. By and large the format chosen using keynote challenges, selected case-study papers and workshop settings was the implementation of these objectives.

We can report, post-conference, that we had about 600 registered delegates representing 42 coastal nations. Of these, in the order of 25% were from, or represented, community level interests—a significant achievement. This conference too, benefited immensely from the first Coastal Zone Canada Youth

Conference, and the open participation of many of the coastal First Nations of British Columbia. The participation of these groups inspired many of us, and continues to do so to this day.

The workshop format generated, over the three half-day sessions, almost 90 possible tools (see pages 125-211—this volume). They are in various states of completeness and detail. As part of our responsibility to ensure ongoing dialogue, post-conference, we contacted authors or groups who identified themselves with each tool. The response to our call was mixed, but not surprising: only a small group of individuals completed their tools for inclusion in this volume. For the remainder, two members of the CZC '98 Organizing Committee assessed each tool and began a process of categorization. From this process we created the Coastal Challenge Toolkit as part of this volume. There are 57 relevant tools or tool frameworks under six categories: Training and Capacity Building, Communication and Awareness, Empowerment, CZM Framework and Process, Knowledge, Policy and Planning. The challenge we pose to the participants and other coastal zone practitioners is that you use the framework information provided, and select and adapt for your use, one or more tools. Workshops at future CZC conferences will request reports on how these tools have been adapted and implemented in your communities.

While our original vision, that of providing a conference for and with coastal communities from around the world, was huge and though the realities of planning and financial processes required some compromise, the Organizing Committee for CZC '98 is confident that all the objectives set out were met. The Challenge Volume and Toolkit will form a lasting legacy to CZC '98 and the International Year of the Ocean. However, there is yet one more challenge; the two of us will now take the material in both CZC '98 volumes and develop a synthesis for publication either in a future CZC volume or in another publication.

Michael Dunn, President
CZC(BC)Association

John Pringle, Chair
CZC '98 Publications Committee

INTRODUCTION

Nous voici à presque deux ans de la ZCC'98 et le nouveau millénaire est déjà entamé; il est temps de réfléchir aux événements qui se sont déroulés durant la conférence tels que présentés dans ce volume ainsi que dans notre vaste compilation de résumés *Communautés côtières du 21e siècle: Partager notre expérience—Développer nos connaissances.* Lors de l'ouverture de ZCC'98 nous, les délégués, avons été comparés à un microcosme détenant toutes les espérances, les valeurs, les interrogations et le savoir représentés collectivement par nous tous. Nos buts étaient: l'intégration, le partage du savoir et de l'autorité, l'équité pour toutes les opinions ainsi qu'une interaction positive entre les participants. Voilà ce qui sera sûrement requis pour modifier les tendances de la deuxième moitié du siècle dernier afin de créer des alternatives futures positives pour nos environnements côtiers.

Nous avons célébré l'Année Internationale des Océans avec une synergie qui est inhabituelle pour des conférences de cette nature. Pendant un bref instant nous sommes devenus un groupe cohérent partageant une même vision pour un avenir juste et durable. Plusieurs d'entre nous avons quitté la conférence avec une vigueur renouvelée nous permettant de poursuivre ce que nous avons appris et entendu durant la conférence et de mettre en application ce savoir dans notre propre environnement. Cette énergie a été utilisée à plusieurs reprises après la conférence durant la conception de ce volume des Défis.

Malgré le sentiment que la conférence se soit déroulée il y a longtemps et le fait que plusieurs d'entre vous soyez retournés à vos rôles et responsabilités, traitez ce volume comme une référence pour les expériences partagées durant ZCC'98. Tout comme le volume d'accompagnement fourni à la conférence, ces deux documents contiennent un excellent sommaire des efforts effectués par les communautés canadiennes et internationales pour intégrer les facteurs écologiques, sociaux, et économiques; pour

identifier les besoins d'utilisation de la science au niveau de la communauté; et enfin pour donner de l'autorité aux communautés locales à l'aube du 20e siècle.

En rapport avec le but principal de l'association de la zone côtière canadienne qui est de fournir des expériences tangibles et adéquates pour les délégués de chacune de ses conférences biennales, le comité organisateur de ZCC '98 s'est donné le défi de développer un événement qui entraînerait vraiment la participation de toute la communauté. A l'intérieur de ce défi, l'emphase a été mise sur les communautés côtières des Jeunes ainsi que sur celles des Premières Nations. Nous nous sommes entièrement dévoués à ce défi durant les presque trois ans de préparation qui ont mené à la conférence. Ce devait être réalisé pour les communautés côtières, par les communautés côtières, et avec les communautés côtières. Nous avons reconnu le fait que les conférences traditionnelles tenues par les experts ne sont pas attrayantes pour les communautés locales à cause de certaines peurs: peur d'être trop techniques, peur de ne pas être appropriées et/ou peur de participer. Nous avons donc limité le nombre de sessions simultanées dans le but de répondre aux besoins primaires de la conférence: celui d'obtenir une interaction serrée entre les délégués, et celui d'encourager un dialogue ouvert et des processus créatifs qui mènent à des résultats tangibles. Le comité organisateur a travaillé avec diligence pour fournir une information généralisée ainsi que pour assurer le fait que les délégués aient interagi et partagé leurs idées, leur savoir, et leurs sentiments sur la gestion intégrée du littoral. D'une façon générale le format choisi, utilisant les défis, les articles d'étude de cas sélectionnés, et les ateliers principaux, résulte de la mise en application de ces objectifs.

Nous pouvons maintenant affirmer que 600 délégués inscrits ont représenté 42 nations côtières à la conférence. Parmi ces derniers, environ le quart provenait de la communauté ou représentait les intérêts de cette dernière—une réalisation de taille. La conférence a aussi immensément bénéficié de la première conférence Zone Côtière Canada Jeunesse ainsi que de la participation de plusieurs Premières Nations du littoral de la Colombie-Britannique. La participation de ces groupes a inspiré plusieurs d'entre nous et elle se fait encore sentir à ce jour.

Au cours de trois sessions d'ateliers d'une demi-journée chacune, presque 90 outils ont été générés. Ces outils sont présentement à des stages variés de complétude et de détails. Suite à notre responsabilité post-conférence d'assurer un dialogue continu nous avons contacté des auteurs ou des groupes qui se sont identifiés à chaque outil. Les résultats de notre démarche ont été variés mais non surprenants. Seul un petit nombre d'individus ont complété leur outil pour l'inclure dans ce volume. Pour le reste, deux membres du comité d'organisation de ZCC '98 ont étudié chaque outil et ont entrepris un processus de catégorisation. Suivant ce processus Cynthia Wright a créé la "boîte à outils" du défi côtier faisant partie de ce volume. Elle comprend 57 outils pertinents ou encadrements regroupés en six catégories: formation et développement de capacité, communication et prise de conscience, responsabilisation, encadrement et processus de la gestion de la zone côtière, connaissances, modalités et planification. Le défi que nous proposons aux participants et autres praticiens de la zone littorale est d'utiliser l'information fournie ainsi que de choisir et d'adapter un ou plusieurs outils à leurs besoins. Les ateliers des futures conférences ZCC vont exiger des rapports sur l'adaptation et la mise en application de ces outils dans votre communauté.

Même si notre vision initiale, celle de réaliser une conférence pour et avec les communautés côtières du monde, était de taille, et malgré le fait que les réalités de la planification et des aspects financiers aient exigé certains compromis, le comité organisateur de ZCC '98 est confiant que tous les objectifs visés ont été atteints. Le volume des Défis et la boîte à outils représentent un héritage durable de ZCC '98 et de l'Année Internationale des Océans. Cependant un défi demeure encore: nous allons maintenant développer une synthèse du matériel disponible dans les deux volumes de ZCC '98 avec projet de publication soit dans un prochain volume de ZCC ou dans une autre publication.

Michael Dunn, président, Association de la zone côtière canadienne (C.-B.)
John Pringle, président du comité de publication de ZCC '98

WELCOME

Miles Richardson
Former President of the Council of Haida Nation
Chief Commissioner, British Columbia Treaty Commission
#203-2255 West Pender St.
Vancouver, B.C., V6E 2P4

Good people, on behalf of Coastal Zone Canada '98, to all of the people gathered here from different parts of the world, from different cultures and different places, on behalf of this conference, I want to acknowledge the Songhees and Esquimalt Nations for welcoming us into their territory, into their home in such a beautiful and wonderful way. I thank you for your welcome and trust that all of us gathered here for our important deliberations can do so with clear mind and good nearts. I am Kilsli Kaji Sting, from the Eagle clan of the Haida Nation, and I am also Miles Richardson. I am very honoured to have been asked by the organizers of Coastal Zone Canada '98 to act as conference President in these important deliberations.

This is an important time for this coast, in the relations between people and this coast that we have come to know as British Columbia. The matters that we are gathered here to focus our minds on, the coastal zone and our relationship to it as peoples, and as societies, are absolutely essential, thus we must get our house in order in terms of our relationship to the coastal zone and amongst ourselves. As peoples, and we have had First Nations such as the Songhees and Esquimalt and many other First Nations represented here at this conference, living very productively in these areas. Each has developed rich cultures from the intricate relationships that have developed over hundreds of generations from the richness of the coastal zone. I ask and pray that each one of us, as we address the matters at hand and as we have been reminded this evening, keep the wisdom of those that have gone before us and keep in mind those that are yet to come as we grapple with these issues that are squarely before us today.

We are gathered here at this conference with a very clear purpose. We want to talk about community-based, integrated coastal zone management. We want to bring together people who have experience in this important area and we want to share information amongst all of ourselves. We want to share our various experiences, and put together a toolbox for action, so that when each of us returns to our homes we can use them to live better.

Over this conference there are three main themes that we will be exploring together. We will talk about the challenges of integrating social, economic, and ecological factors in the coastal zone. We will be discussing the need for and ways of considering science in the coastal zone. Finally, and very importantly, it is a unique opportunity, given our evolving history, that we are here in British Columbia, do discuss the matter of empowering communities in coastal zone management. To empower communities, whose place, whose homes are on the coastal zone, to live in a way that is respectful of the rest of creation; that is respectful of the divergent needs of different people who depend on the coastal zone for their well being.

I look forward to our discussions on scientific knowledge and information; to learn what we have come to know in that area as important as that is; of integrating it with our accumulated experiences with the cultures that have evolved; of integrating it with the ways of living that have evolved on this coast and in different parts of the world. We will put our minds and our hearts together and discuss better ways of living, with respect for the wonderful richness of the natural world and human society. So I look forward, very much, to participating in this conference. Again, I am very honoured to have been asked to be President. I look at this as an opportunity to take this knowledge that all of you bring and share, and put it into a toolbox that we can use to make change that reflects our desires and ways of living.

OPENING ADDRESS

The Honourable David Anderson
Minister of Fisheries and Oceans,
133 East Block, House of Commons
Ottawa, Ontario, Canada, K1A
Current Title: Ministers of the Environment

Introduction

Good evening, everyone. A special welcome to those of you from other countries.

It is a pleasure to participate in Coastal Zone Canada '98, and a particular pleasure to join you in my hometown of Victoria. I am especially pleased to welcome the youth delegates. It was here on Vancouver Island that I received my own early lessons in conservation and respect for the outdoors. But today's youth have been given an even greater responsibility. They are the first generation to grow up in the full knowledge that our current way of life is not sustainable. They are also the first generation to grow up knowing full well that global ecosystems are interdependent. We now realize that oceans provide a crucial conduit through which poor environmental stewardship in one part of the world can affect an ecosystem thousands of kilometres away.

My generation has come to this understanding later in life. You are aware that here in Canada we are living with the unsustainable ways of the past. On the East Coast we have placed commercial fishing moratoria on most cod stocks. Recovery is proving to be slow, uncertain and painful. On the West Coast we are dramatically reducing our salmon catches to levels the resource can sustain while working to improve habitat. This will give the resource the best chance to recover and thrive. Canada is not alone in facing this challenge. Everyone is struggling to change from the unsustainable ways of the past to a relationship with nature that recognizes it is not merely an opportunity to exploit, but that it has limits, which must be respected.

A recent World Wildlife Fund report has stated that 70 per cent of the world's 200 most valuable fish stocks are either depleted or overfished. It suggests that scientists are finding that the loss of fish species is setting off a chain reaction that limits the possibilities of recovery. The report cites overcapacity, brought about by the growth and modernization of fishing fleets, as a fundamental problem. According to the report, this has been a problem in many parts of the world since at least the 1970s. Perhaps the problem has been that my generation saw the world as Joseph Conrad once wrote, "I remember my youth and the feeling that will never come back any more—the feeling that I could last forever, outlast the sea, the earth, and all men." Youth today would have looked at this statement differently, knowing that the sea, as we know it, is not forever. That is just one of the reasons that we are all here today. We have some important work to do on a very important global resource … our oceans.

Oceans cover over 70% of the Earth and are home to over 80% of its known living organisms. They interact with the atmosphere, the sea floor, and the land to maintain conditions for life on earth. Oceans provide more oxygen than even the rain forests. Marine conservation is not simply about protecting the environment, it is about protecting ourselves as a species. Over a hundred and fifty years ago, in 1827, a mathematician by the name of Jean-Baptiste Fourier speculated that human activities had the capacity to affect the Earth's climate. The evidence on the importance of our oceans to every single activity on this planet grows daily—and we are seeing more and more the effects of our own, human, activities on them. 1998 has been a record year for high temperatures, for rainfall, for El Niño, for floods—the list goes on and on. Despite this, we still know less about the seas than about the surface of the moon.

International Year of the Ocean

Perhaps it is fitting, then, that with this record evidence of the power of the world ocean, the United Nations designated 1998 the International Year of the Ocean. This designation was important to Canada, and our nation has been an enthusiastic participant. We have adopted the UN's stated goals for the year—to make people more aware of the ocean, to bring oceans related issues to the forefront, and to build a lasting legacy of programs that support the world's oceans.

In fact, so far this year Canada has managed to get almost 30 countries to sign The Ocean Charter. We have gathered the signatures of tens of thousands of Canadians and citizens of the international community to My Ocean Charter, a personal version of The Ocean Charter. We have developed, in co-operation with one of our provincial governments, a grade 11 science curriculum on oceans. And, among other things, we have set up the Youth for the Oceans Foundation, a foundation that is dedicated to providing a continued focus for ocean-related activities in the education system of our country for years to come.

The concept of the Youth for the Oceans Foundation actually came from last September's Summit of the Sea, which is where I launched The Ocean Charter campaign. Held all the way across Canada to the East, in St. John's, Newfoundland, it was at the Summit of the Sea that youth from various nations were invited to participate in the proceedings and to give a wrap-up of what they had learned throughout the event. What came out loud and clear was that they care about the oceans, and that they want to continue to be involved in oceans issues. So, again, I welcome the youth to this conference—I welcome your enthusiasm, your new ideas, your perspective and your creativity. And I congratulate the organizers for ensuring that this vital group is here to learn and to share information on oceans protection and conservation with the rest of us.

In Canada, our government has committed to putting conservation first, not only because it is the right thing to do. Conservation is not always an easy goal, nor are the steps necessary to achieve it painless. But, for our sakes, and for the sakes of future generations, we must continue to see it as one of our highest objectives. Canadians are not only economically and socially tied to our oceans; it is a part of our heritage. Even though only about twenty-three percent of Canadians live in coastal communities, those living inland appreciate and benefit from our marine connection and oceans industries.

Canada's Oceans Act

To demonstrate our commitment to oceans, we took advice from Canadians, and from the National Advisory Board on Science and Technology, and we introduced into Parliament an Oceans Act. This *Act*, which came into force in January of 1997, gives me, as the Minister of Fisheries and Oceans, the federal lead in several areas, including in the collaborative development and implementation of an Oceans Strategy. In January of this year I released a discussion paper on this Strategy to engage citizens in its development. I will soon establish a national panel of oceans experts who, over the next few months, will consult broadly with the public on oceans issues, and who will make recommendations to me on the key elements that should be contained in an Oceans Strategy for Canada. Some basic authorities and management tools to be used within the context of integrated management plans are provided in *the Act*, under the umbrella of the Strategy. These tools include Integrated Coastal Zone Management, Marine Protected Areas, and Marine Environmental Quality norms, guidelines and standards.

The *Act* also includes three very important principles—these principles underlie every move that we make on oceans. And, we feel, they are critical to our success. The three principles of the Act are integrated management, sustainable development and the precautionary approach. As Minister of the Department of Fisheries and Oceans, every decision I make has been, and will continue to be, guided by the principles outlined in the *Oceans Act*. I am bound to them not because of the legislation, but because I know that it is the right thing to do. Sticking with these principles will help me to turn the objectives of the *Oceans Act* into concrete actions.

The *Oceans Act* is also about looking at ecosystems, and not at a single species of plant or fish, or at a single molecule of water. Good management requires conservation and protection of the entire ecosystem. Dr. John Keesing, chief scientist of the South Australian Research and Development Institute, recently made a great case for the ecosystems approach. Dr. Keesing said that "traditional approaches to ocean research and management have not been holistic enough. The analogy on land would be management of koalas without understanding and looking after the trees they live in." How true. Good management requires the regulation and development of land use to ensure habitat protection and productive capacity but, most of all, good management requires that we understand the ecosystem itself.

We all know that in our daily lives, relationships are key. The same is true of the marine environment. The relationship among the many living and non-living resources is what makes an ecosystem work, just as successful conservation requires that all the major stakeholders—industry, fishers, conservationists, communities, recreational users—all of us, sit around one table to make our comprehensive, integrated plans work. We must strike a balance in managing our oceans. The imbalance that exists today, and that we are trying to correct, was recently stated eloquently in that, around the world, "we put too much in and we take too much out." This must stop. We must look at all factors, and how they relate to one another.

This is the approach that the Department of Fisheries and Oceans is taking. I have made a personal assurance to ending the fragmented approach that has prevailed until recently. On Oceans Day, June 8, of this year, I established an Oceans Sector in my department. This reflects the high priority that I attach to providing a clear focus for oceans issues and for ensuring an integrated management approach within the Canadian federal system.

Integrated Coastal Zone Management

In terms of Integrated Coastal Zone Management, there are already several successful models upon which we can build new programs. These will be described to you throughout this conference, and I know that many of you will have equally successful stories to share. Stresses on the oceans are especially intense in coastal areas. Integrated Coastal Zone Management does not aim to inhibit economic activity in the coastal zone. Rather, ICZM aims to ensure that development occurs in a sustainable manner. It is a continuous process of planning where we look for the best mix.

The "I" in ICZM is critical. Integrated will mean many things:

- the integration of all stakeholders and regulators in a shared planning process;
- the integration of values—economic, social, and cultural;
- the integration of many forms of knowledge, both traditional and scientifically derived; the integration of legislative instruments to manage the coast as a whole; and
- the integration of federal, provincial, territorial, Aboriginal, and municipal activities in implementing decisions and monitoring consequences.

Marine Protected Areas

Marine Protected Areas are another valuable tool we can use to meet the goals of ICZM and the Oceans Strategy as a whole. MPAs will form the cornerstone of Canada's conservation efforts. The *Oceans Act* and the development of an MPA program present an exciting new challenge for my department and for Canada. Over the past several months, we have developed a policy and framework for establishing and managing MPAs. We are now very close to initiating pilot projects as part of the MPA program. I look forward to making an announcement later in this conference.

Closing Remarks

The oceans contain diverse ecosystems that we are only beginning to understand. Properly managed, Canada's oceans have enormous potential to benefit both present and future generations. The *Oceans Act* sets the framework for effective integrated management based on the collaboration of many people and groups. This collaboration is essential if we are to succeed. Much of this benefit will come from adhering to the strong principles set out in the *Oceans Act.* Integrated management and sustainable development are two key concepts. And there's another—one that is very important to our conservation and protection efforts in the oceans.

When mapmakers were creating ocean charts in centuries past, if they ran out of known world before they ran out of parchment, they would simply print the words "Here be dragons." I like to think of those mapmakers as the earliest practitioners of what we now call "the precautionary approach." In short, if you don't have all the information, proceed carefully and err on the side of caution.
Look out for dragons.

I am committed that Canadians will continue to benefit from the oceans. To achieve this, we must conserve and protect our oceans and their resources. Working together, I am confident that we can achieve our goals.

I'd like to end by wishing all of you a successful conference. I look forward to hearing of your experiences, and to sharing ours with you.

TIDES AND TIME: THE POWER OF THE FOURTH DIMENSION
THE RISING VALUE OF TIME IN COASTAL CO-MANAGEMENT

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Introduction

As a first, and most important order of business, I offer congratulations to the organizers of Coastal Zone Canada '98 and to the others whose work they carry forward with determination and style. Over the past four years, these conferences have nurtured the creation of an international network of people who share a commitment—and a passion—to cleaner coasts, healthier coastal regions, and a sustainable future.

It is a great pleasure to be among you this evening; I am deeply honoured to have been invited to share some thoughts with you. Many of us have travelled from distant shores, all belonging to the planet's one ocean. I have just travelled from a two-month assignment in the Republic of Marshall Islands. Its capital, Majuro, sits on an atoll in the Pacific Ocean; a narrow, flat strip of coral, forty miles long with an average width of about two football fields and a bowling alley. It is not many inches above sea level, and during rainstorms the puddles give a whole new meaning to the concept of "sea level rise."

It also gives a new dimension to the concept "watershed" and "coastal zone." There is no inland, no streams or rivers, only that 40-mile coastline. The only watersheds are vertical-human beings and houses—and the "coastal zone" is defined more by the ocean than by the land.

No matter which shores from which we have travelled, we're all part of the same concerned, coastal zone community, travelling under the same colours and with the same compass. The question I wish to raise this evening is whether or not we are time travellers as well, and if so, what time is it, anyhow? *And whose? And how much is left?* Over the next five days, we will be talking a great deal about community-based coastal-zone management. Not so long ago, that was a pretty exotic concept.

Stakeholders

Twenty years ago this was not a household word; it conjured images of vampires and vicars, *(or maybe those styrofoam trays in the meat department).* Today, we all know there can be no *effective* Coastal Zone Management without Co-Management. What *you* do through these conferences is to invest that truism with your knowledge, your research and practical experience and help to make it more than a high-flown slogan—*no management without co-management.* And it gives strength to your efforts that each of these conferences has built on the one before. Two years ago, at Coastal Zone Canada '96 in Rimouski, we were asked for our ideas about what is this thing, co-management. This year, we have before us a framework for the practice of co-management. That's an accomplishment in which you can take pride.

What can I contribute? Well, co-management takes place within a framework of law, and if there's one thing I can talk about, it's the law. Since I write fisheries laws, be prepared to hear about fish; like us, many of them also call the coastal zones their "home." I'd like to talk about what's involved in the preparation of fisheries laws, about how it's almost necessary to grow gills to appreciate what is happening underwater, and about recent changes in the social and political environment in which these laws are written, some of them very positive changes. Mostly, I'd like to speak about the power of the fourth

dimension in this new environment: Time, Short Time and Long Time;

- Short Time is a deadline marked "yesterday"—it is all that most people are given in the face of rapid, upsetting change.
- Long Time is a growing season—what it takes to grow the values and ideas needed to support the laws and policies that underlie sustainable development.

Making the best of both kinds of time—short and long—is part of the challenge.

To begin with, let's go to Hollywood and start with a wide shot. Sit behind a powerful lens; pull back with me a little way in time, and a long way out in space. The shot I have in mind is the picture of Planet Earth as it appeared to the astronauts in the Apollo space program from the vicinity of the moon. That was the first time we'd seen what we looked like from outside the envelope and we hadn't realized how beautiful we were. You all know that picture: the shining blue sphere set against the darkness of space, veiled here and there with clouds, but ever so clearly blue, an ocean planet.

That image has become as much a part of the common heritage of humankind, as the Mona Lisa. It's an icon for people around the world. And like any icon, it embodies an idea. When we see this image of the Blue Planet, we recognize how utterly dependent we are on its health. And how much that health is in our hands.

The power of any icon lies in what we bring to it. The values it sustains and reinforces are values that grow out of childhood experience, education, and the behaviour of others around us. If these values lead us to cherish our environment, the icon of the Blue Planet becomes the symbol of our stewardship.

One reason I respond so strongly to those pictures from space has to do with childhood. Every summer was spent in Prince Edward Island. What I remember best is putting out in the inshore lobster boats of my family's friends and the excitement of watching as the sea yielded up its spiny critters. It's hard to say how much those days on the water contributed to my decisions as an adult to study the international law of the sea, and to teach, practice and be committed to strengthening that law.

But it's safe to say that we all share similar experiences; from memories of little boats and big hearts, to the awe of our place and purpose in a small blue planet, in a solar system a third of the way from the edge of a galaxy, that is itself a relative speck of dust in a universe and even greater cosmos. Sharing personal experiences and collective purpose inspires us to create a future world which is stronger than the sum of its parts—and this is what you will be doing this week.

What time is it now? Time for the oceans—it is the International Year of the Oceans; the culmination of an extraordinary era in which to be involved with the ocean and its resources. It is as exciting a time for practitioners of "oceans law" as it is for coastal zone managers and all other oceans people—opportunities for innovation are beckoning vigorously.

The new era, starting with the sweeping reforms of the United Nations Convention on the Law of the Sea and continuing through the Earth Summit and its many spin-offs, conferred both great resources, and great responsibility on coastal states. Manganese nodules? Integrated Management? Marine Environmental Quality? Land-based pollution? Very few coastal States—or international organizations—were ready for this. They certainly never told us at law school that the written word is one thing, but that implementation of the new Convention would not be possible without other important factors: hard cash—which involves another kind of resource allocation—and political will. And, for the private sector, environmental accounting.

All of us here took up the challenges in our separate ways, so we could each contribute our unique experiences to the whole. In my case, it included travel to the Pacific Ocean and the South Pacific Forum

Fisheries Agency, where sixteen island countries and their surrounding seas covering one-twelfth of the planet became my "beat." It eventually brought opportunities to collaborate in the drafting of fisheries legislation and treaties for countries around the globe: to observe how people in those countries make decisions; and to observe the results of those decisions.

Real-Time Law

There's a tendency to think of writing laws as a dry exercise. They can all look the same on two-dimensional paper: here's the rules, don't mess up, or you're toast! Any lawyer can write a law whether it's to regulate traffic or to tell us how to dress. So what's different about writing laws to regulate how we catch fish? Sometimes in the past, unfortunately, people who should have known better—and would have if they'd thought about it—didn't see much difference. That "one-size-fits-all" approach, not surprisingly, was not very effective. Good laws are living laws. They exist in real time. Writing laws for the management of living marine resources is a process of full immersion in each country's unique economic, political, cultural and environmental realities.

These laws are really not to manage fish, but to manage human activities in relation to the fish and their environment. What I am about to say regarding writing fisheries laws also applies to laws managing human activities anywhere—including the coastal zone. And it illustrates the importance of the laws themselves in not only regulating, but also in shaping our behaviour.

Being a fish lawyer certainly is not a dry activity. It takes an affinity for salt water. Not to mention journeys on patrol boats, flights in surveillance aircraft, fishing expeditions everywhere and beers all around at the end of the day. Practicalities come first. It also helps to find fish interesting: where they swim, and why, and when. Their feeding habits; their mating habits; their range and life span. Then there's the economics and sociology of a country's fishing industry: the vessels, large and small; the processing plants; the communities involved; where and how the fish are sold; and to whom. Becoming familiar with worldwide eating habits, from Japanese to American to African is part of the job.

You're still just part way up the learning curve at this point. What about the circumstances of the country? What is the form of the national and local governments; the politics and politicians? How much power do the officials have? What are the rights of traditional fishermen and the land tenure system in coral reefs? Who tries to avoid the law, and how? What are the national policies; are they wishing to privatize their fishing industry? Or participate in it? What is the state of relations with neighbouring countries? The state of environmental legislation? Food-processing laws?

We also must also ask what provision shall be made for co-operative management among, not only different levels of government, but other stakeholders? It's now standard to include a framework for such cooperation in fisheries laws, but there's no off-the-shelf formula. The provisions will differ from country to country depending on geography, demography, resource base, constitution and political situation, as I'll describe later.

And, there's a large legal framework to consider as well. The international framework created by the United Nations Convention on the Law of the Sea, other international instruments, regional treaties and many bilateral and regional agreements. We're long past the day—or should be—when nations can manage marine resources as if they had no obligations beyond their own boundaries.

So the understanding must be both local and global. And it also must be oriented in Time: both past and future. Not forgetting the most important of all, the present. On the one hand, what are the traditional practices and values with which the law must connect? On the other hand: What is the future of the fish? The government? Technology? Markets? International standards? Ignore these questions and you could be sewing a strait-jacket.

Knowing the important questions is a start. And you have to be all "ears" for the answers when you enter a country to help write fisheries legislation. No law should be written without weeks and months of listening to all involved: the fishers, the community groups, the cabinet ministers, the scientists, the managers, the enforcement authorities others. The legal draftsperson, must be above all, a diplomat; able to listen to all points of view, match them to the facts and identify solutions that will make the law strong and acceptable to all, especially to the resource.

Just listening to people, hearing them out, can make the difference between the success or failure of a management initiative. In one African country seeking new fisheries legislation, local fishermen had no strong tradition of conservation. They could not believe that overfishing was the reason for their shrinking catches. Their explanation was that the fish were hiding; they've got smart, and know not to be caught.

If you continued to listen, however, you also could learn that it was the traditional duty of the village chiefs to ensure that the fishermen always brought home ample fish to feed the community. The chiefs instructed the men on where to go in their canoes and at what time of year. And so that country sent a lawyer and a sociologist around from village to village to explain to the chiefs the meaning of fisheries management, and the content of the proposed fisheries act, and to seek their input. That law, jointly developed, is now in being.

That experience, too, was part of the learning curve, a very steep learning curve. And not just for me. Governments, international agencies and others have all had to make the same climb. Two decades ago, the resources seemed limitless and management regimes were established accordingly. The big decisions were political: who should get what? What shares for the inshore? And the offshore? How much for foreign vessels in return for what considerations? The "grab ethic" was appealing to governments and fishers alike because there was a resource to grab onto. Business was commensurately good for the political lobbyists.

Listening and Learning

The same pressures exist today, but there has also been an awakening. The wakeup call came from, of all quarters, the resource itself. Of course, it is very hard to hear any sound whatever from a resource in a state of collapse, which lives underwater and far out to sea. So other voices rose on its behalf, one being that of the United Nations Food and Agriculture Organization. In a very loud voice, it told us four years ago that 70% of the world's fisheries were very unhealthy: either fully fished, collapsed, or recovering from collapse.

We can see that a great shift has occurred. In government and the international agencies, the emphasis has evolved from lobbying to learning and listening. The new voices being heard are those of the NGOs who have done their research and strategic thinking: The voices of associations representing fishworkers and coastal communities; The churches. Of thoughtful academics. Of the First Nations. Even the voice of the consumer is now heard from time to time; these consumers are no shrinking violets.

The lobbying continues, of course. But in many countries it's more a question of which lobbyists will be heard? Those with money? Those with no money and no learning? Or those who have taken the time to learn?

No one is naïve enough to say that money and power are no longer in vogue. But I, for one believe we are making inroads by learning about the resource, and about how informed citizens can effect change. Industry groups contribute by learning about the consequences of fishing practices, techniques and gear that devastate the resource. And governments are learning too, about policies that don't work—such as oversubsidization; and those that do—such as co-management.

An example is the Atlantic Coastal Action Programme. Those of you not already familiar with its successes will be hearing more about ACAP this week. Community groups, industries, and individuals have formed committees in thirteen locations across Atlantic Canada. With support from Environment Canada, they set objectives and plans for environmentally-sound development of local resources. It's a demonstration of the new relationships possible between government and community. A relationship in which the *community* is groom and government plays best man.

Another example of new a learning relationship was created in 1993, of the Fisheries Resource Conservation Council in Atlantic Canada. Here was a case of Fisheries and Oceans Canada getting stakeholder advice at arms length. Someday soon, perhaps we'll be able to speak of a two-door "breeze-through" policy when the planned Pacific FRCC is created.

The interaction between government and the National Round Table on the Environment and the Economy is another example of change. It has resulted so far in a comprehensive blueprint for co-management and generated a lot of good will and enthusiasm. How far can it go? We'll see what happens after the passage of amendments to the Fisheries Act.

And we'll also be watching as the Global Program of Action for the Protection of the Marine Environment from Land Based Pollution is implemented through the Gulf of Maine Council, which has done exemplary groundwork in bringing together stakeholders, including communities, industry, First Nations and a range of scientific expertise. It is working within a regional superstructure—the North American Free Trade Association and its Commission for Environmental Cooperation—as one of two important pilot projects in North America.

Without wanting to sound too optimistic, this may be a place to mention changes in the "big-budget", international development agencies. The World Bank, previously concerned more with building dams than moulding management, has clearly turned over a new leaf. Its projects must now pass environmental and social analyses that would have saved the Bank a lot of criticism had they been required a few years ago.

Perhaps even more significant, the Asian Development Bank seems to have "caught the same boat." The ADB is recently involved in fishery and coastal development projects in southeast Asia and the western Central Pacific. Its participation is especially important given the current economic situation. Its new Policy on Fisheries, published in 1997, explicitly commits the ADB to a "participatory process" in the design and implementation of projects. It calls for active involvement by communities, NGOs, voluntary organizations and the beneficiaries of the projects. From now on, the key words are; sustainability, equity (among resource users), and efficiency. Having participated in World Bank and ADB projects over the last several months, I can attest to the implementation of the policy.

These are important changes in the Big Budget agencies; we need them to be effective. They are in a key position to move us towards the goals on which the international community has agreed. For example, the goals that were spelled out in Agenda 21. If, as they say, they are buying into the idea of broad community-based management, those goals may not be quite so remote as they often appear.

There is another reason to believe the changes described are real and substantial. We as individuals and communities are better able to become involved in partnerships than in the past. First, we're better informed, or we have the opportunity to be. Secondly, we all know the Information Age has given individuals more power than ever before; our portable computers can store more information than the entire Vatican Library. A better-informed public can be a more assertive public. The days when the principal channels of communication flowed just one way, from government to the public, are long gone. As the gurus of the Information Age tell us, "the network has replaced the pipeline." Learning and listening have become not just a two-way street, but a multi-dimensional activity; and an interactive one as well. People now come together around issues that are important to them as individuals.

One result is the growing influence and effectiveness of non-governmental organizations. It is a foolhardy government that fails to pay respectful attention to the well-researched and well-presented positions of these organizations. NGO membership represents an extraordinary resource for information, financial and logistical support and for the mobilization of opinion. And the NGOs are finding ever-new ways to use their advantages. Eco-labelling for products from lumber to dolphin-free tuna has proved to be a quick route to a governments' attention.

The real breakthrough comes when governments and NGOs find ways to work together. There are now many examples of this sort of collaboration. I can think of none that demonstrate the potential better, however, than two related conservation campaigns co-ordinated by the South Pacific Regional Environment Program. These are regional education and awareness campaigns directed at conservation of sea turtles and coral reefs in an area that includes twenty-two small-island, developing states covering thirty million square kilometres of ocean.

They are excellent examples of complex integration made to look easy—knitting together donors, as well as participants. The Sea Turtle Programme designated 1995 as the Year of the Sea Turtle. More than 43 government and NGO agencies were active in the network, including national and international NGOs, local church, youth and other community groups and the private sector. All unpaid. All giving of their time.

And back to Hollywood—musicians and videomakers donated time and their creative talents to produce a turtle rap music video. The paramount chiefs in Fiji donated special meeting times to the campaign, and called on their government to take action. One success factor for these programmes on marine turtles and coral reefs is the high degree of ownership of the campaign initiatives, as the design and implementation of the campaign plans were fully participatory. Other measures of their success were the attention they gained in the media and the schools, and the momentum they generated. The regional networks that took shape in the campaign are now exploring the possibility of new activities, and have extended into a larger plan for action. Once governments, organizations and communities take a step across a line together, a whole new field of opportunities appears before them.

Freeing the Future

Listening, learning, and acting together are essential if we hope to influence the future. Occasionally, we get perspectives on how far we have progressed, and how far we have to go. Earlier this summer, I met a gentleman on his way to Johnston Atoll, four islands about midway between Hawaii and the Marshall Islands, where I was heading. During the Cold War, the U.S. military used it as a missile-testing site and in 1962 a launch-pad explosion scattered weapons-grade plutonium across the atoll, deeply embedding it. For a long time, no one seemed too concerned about the contamination. The military continued to use the Johnson Atoll, as did sea turtles, monk seals and a hundred thousand nesting pairs of sooty terns. The Pentagon now wants to hand over Johnston Atoll to the federal Fish and Wildlife Authority and to the State of Hawaii. But it first must clean up that thirty-six-year-old mess, to the standards set by the Environmental Protection Agency. The traveller, a physicist, was hired to assess just how big the job will be. Probably, it will mean transporting hundreds of tons of radioactive debris to disposal facilities in Nevada. The cost will likely be between twenty and thirty million dollars.

One reason for telling you this story is for the lessons learned about the evolution of attitudes and standards. The cleanup on Johnston Atoll is not an act of conscience, as it might have been were it cleaned up in the 1960s. It's a legal obligation. It represents a standard of accountability for government agencies that has resulted from years of research, debate and legislative movement. The second reason for this story is for what it doesn't say. Johnston Atoll is a problem with a possible practical solution. Complicated and expensive though the effort may be, the challenge is measurable and achievable.

Most of the problems that concern us are not so easily isolated and resolved. The deterioration of the coastal and marine environment is primarily the result of human actions over prolonged periods of time. The social, economic and natural reactions we are now trying to address were set in motion, in some cases, centuries ago. They cannot be simply arrested and reversed through huge investments in even more infrastructure or the passage of new laws. Indeed, one of the first things we have had to learn is that the Big Buck projects often produce unintended consequences that compound the difficulties.

I've had reason to think about this in the Marshall Islands this summer. This Micronesian Republic is coming to the end of a Compact of Free Association with the United States that has paid it around a billion dollars over the past fifteen years. The Marshallese are in search of new income. There is pressure for a quick fix, but there may not be one. For two thousand years, until the nineteenth century, the Islands supported, at most, fourteen thousand people. They were completely self-sufficient, living on what food they grew, and what the sea provided. Now, the population is around sixty thousand and it's growing rapidly, much faster than the economy. And there's no room to spread out. The Marshalls cover a huge ocean territory: nearly two million square kilometres. But the land area of the islands and atolls comes to only about one hundred and eighty square kilometres!

This community is now vulnerable to high-risk development proposals. Even a scheme for a nuclear-waste storage facility looks attractive though it is still counting the effects of the first H-bomb tests four decades ago. And all that ocean acreage has attracted some peculiar proposals. One I reviewed involved licensing a foreign company to "farm" tens of thousands of square kilometers of ocean by spreading fertilizer across the surface. This supposedly would encourage the growth of phytoplankton and thereby increase fish yields. Here, the "coastal zone" extends far to sea, there; implications of the scheme would eventually impact on the atolls. The promoter offered no environmental impact study and there was little consideration given to the fact the fertilizer might be toxic to coral reefs. No contingency funds in case it was. But he was offering enough money to attract attention. Fortunately, he left the islands without a licence. But bad ideas *are like buses and boyfriends: wait long enough and another is sure to come by.*

The situation in the Marshall Islands is the result of events over a long period; more time is required to complete the return to self-reliance. Only a commitment to sustainable development can make that possible. However, nurturing that commitment is itself a matter of time; it can never be just a matter of writing good intentions into law. Unfortunately, is not an isolated example; the temptation to sacrifice the long-term sustainable future for near-term jobs and income is universal. Resistance to unsustainable development is lowest when people are losing boats, homes, and a way of life. It is precisely at this point that they most need encouragement and assistance to build for a sustainable future. Somehow they must be enabled to see that time can work for them, not against them.

A case in point is the village of Komuniboli in the Solomon Islands. These people wanted schools, health care, and homes. However, they knew the financial returns to the local community would be little more than five percent of the value of the wood if they sold off the forests on their customary lands to the giant transnational timber companies that have moved into the Solomons. The foreign companies' approach is more like mining than harvesting. Komuniboli was fortunate to discover eco-forestry: small-scale harvesting that returns significant income to the villagers, without wholesale habitat devastation. And did it, with support from a consortium of national and international organizations, including a system of eco-marketing of lumber exports to New Zealand. This assistance has put time on the side of the local community; time to develop the technical and management skills needed to maintain the new industry in the future.

Time, sadly, is working against the people of coastal communities in South Sulawesi, Indonesia, however. Their shoreline is being eroded at rates of up to fifty meters a year, ever since the mangroves were cleared and replaced by shrimp ponds. Local farmers have tried, without much success, to replant the mangroves but the seedlings cannot withstand the waves impact.

One possible solution is the construction of a bamboo barrier at about mid-tide level, to reduce wave force. The villagers are ready to do this themselves, and environmental experts in the field have given a "green light" to this scheme but construction of the bamboo devices depends on another approval from the agency involved in providing bilateral developmental assistance for the coastal management program. It has given approval in principle to funding for a demonstration project in one community. It's going to be a while, though, before this experiment gets underway. The Agency, from half way around the world and with its own laws, classifies the bamboo structure as civil works, thus requires an environmental impact study before funds can be released. This will take at least six months, and could mean the loss of another fifty meters of shoreline, the loss of a planting season for some mangrove species, and no progress for up to a year or more in response to an environmental emergency.

The "bamboo debacle" is an example of "short time", and it suggests that a greater emphasis on timeliness and flexibility, and less emphasis on rigid rules might make assistance dollars go farther. Certainly for the people we want to help, time—their time—has a real value. Delay could mean that more villagers will move to the cities, a likely unsustainable, environmentally unfriendly move.

Rising Value of Time

Before closing, I will develop these considerations of time a little further. In a period of currency meltdown, the wise use of time becomes ever more critical. The time people have for learning, for volunteer work, for serving on committees, taking part in discussions represent an investment. And like any investment, it can benefit from informed advice and guidance. Like any resource, its value increases when directed towards agreed-upon goals.

It is imperative that we give more thought to the use of the time people contribute to their communities. It has been suggested that in many organizations, the average period of volunteer burn-out is around three years. Is that some sort of built-in biological limit? Or would the availability of a trained, full-time coordinator or part-time office assistant help make unpaid service more rewarding and less like a penance?

In planning for co-management, will the new structures make allowance for the fact that people will be working in new ways, often having to invest their own time in learning or in meetings or travel? So long as the benefits are apparent, most people will make that investment. Poor management of the volunteer involvement, with schedules arranged for the convenience of the non-volunteer and missed appointments will result in loss of the volunteer; and what a loss! The problem is so obvious that it should hardly bear mentioning, yet when governments look for saving, too often the first items on the cutting block are the resources needed for good management of volunteer services.

Information on learning is now available as never before, but learning (turning information into knowledge) takes time. What are needed are education programs that reflect the basis for managing our shared resources. Communities need to know about all the national and international standards, and laws that have been developed through arduous negotiation over years, e.g. biodiversity, the law of the sea, land-based pollution, to name just a few. Through knowledge of what has been achieved, communities can move forward together, and build momentum.

A case history will help make the point. The government of Canada, in 1992, wanted to showcase the oceans during the United Nations Conference on Environment and Development in Rio. They invited the Oceans Institute of Canada, of which I was then Executive Director, to coordinate an event which would draw attention to the many concerns of the day: coastal zone management, land-based pollution, high seas fishing, etc. We worked for months to create a meaningful event. The participants included four federal departments, a provincial government, NGOs, the representatives of coastal communities, industry and youth, distinguished academics, the International Oceanographic Commission, some Ministers and Prime Ministers past and present, both Canadian and "from away", and an astronaut.

Our efforts paid off. We drew an international audience and on June 8, 1992 Oceans Day was proclaimed. The Earth Summit had come about because the peoples of the world had been educated to "think green." June 8th invited them to "think blue". We didn't know it at the time, but that first Oceans Day was just the start of what was to become a big blue wave of support for the oceans. And an opportunity to develop ocean programs for schools and communities.

The Brazilians suggested that Oceans Day be celebrated around the world on June 8th every year, a challenge we accepted. Over the years, the concept of Oceans Day has since gone with me. A bit like Johnny Appleseed, I've suggestions for programs of action and education have been planted in many soils: individuals, community groups, schools, NGOs, governments. Fortunately, I haven't been alone in planting these seeds. Now the celebration of Oceans Day expanded to various countries around the world; it is proven to be an excellent vehicle for learning and doing.

A few years ago, I approached the Canadian Wildlife Federation (CWF), which has an enviable reputation among educators, to participate in Oceans Day. It produces a range of material on wildlife and habitat. It has trained tens of thousands of teachers in Canada. Recognizing that environmental stewardship starts at home, it has developed a popular, effective "backyard habitat" program that has been adopted in schools and communities across the country. Fortunately, the CWF has chosen to add Oceans Day to its education program. Have created information packages and posters for schools and communities and new pages for the CWF website. Working with governments and other organizations and sponsors, they translated the concepts of watershed conservation and management into everyday language. This year, a "Blue Schools" program provided assistance for local projects to improve ocean quality. Blue Schools don't have to be near an ocean, but they show awareness because what we do affects the ocean no matter where we live.

The CWF Oceans Day program has proved itself in Canada and it could fill a need beyond our borders. Hence, with the cooperation and assistance of others, including the CWF, I have established the Foundation for the World's Oceans. We're still at an early stage of program design, and have only received charitable status. But already, we have a blue-ribbon board of directors, each of them an outstanding international oceans and environmental leader. And the Foundation has a clear goal: to bring oceans education and action to communities and individuals around the world; in so doing, to demystify the mysterious, including the science, the law, the international standards, and build a base for better policymaking and community action.

Every day, new evidence persuades me of the timeliness of this initiative. In my work and the work of others, I see the opportunity and the will. Already there has been made a great investment of time. And it is only just a start. But we are carried forward by convictions that care for the oceans and for the coastal environment are fundamental to our future. Our reward will be the recognition that each of us can contribute to a healthier habitat and more abundant life for all that share this beautiful Blue Planet.

May I commend you for demonstrating the power of the fourth dimension. The rising value of your time is paying big dividends to the coastal environment. Although we are together for but a short time, be assured the results of your work here will endure for a long time. May I wish you all a very good and productive time in the week ahead.

CITIES, CONSUMPTION, AND THE COASTAL ZONE

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Abstract

Urbanization and rising material consumption are the source of most resource- and pollution-related issues confronting coastal zone management. These pressures will increase because the prevailing expansionist development paradigm is incapable of adequately relieving them. Unfortunately, industrial society both misunderstands the origins of the 'ecological crisis' and underestimates its magnitude. Little progress will be made toward sustainability until we recognize that our environmental problem is not the disease itself, but merely the symptom of urban human ecological dysfunction. Western society must therefore adopt an ecological perspective to achieve sustainability.

Requirements for sustainability are best revealed through an assessment of the human ecological niche, based on ecological footprint analysis and the second law of thermodynamics. Modern interpretations of the second law posit that all complex, non-equilibrium, self-organizing systems exist in a nested hierarchy. Each component system is contained by the next level up and itself comprises a chain of linked subsystems at lower levels. Complex systems grow and develop by importing available energy and material (essergy) from their host "environments" one level up in the hierarchy. Such systems must also export the resultant waste (entropy) back into their hosts. Thus, all highly-ordered systems maintain and increase their internal order "at the expense of increasing disorder at higher levels in the systems hierarchy" (Schneider and Kay 1994). This imposes serious constraints on the growth of any sub-system.

Because such systems continuously degrade and dissipate available energy and matter they are called dissipative structures. The human economy is one such "dissipative structure" that grows and develops by extracting energy and matter from the ecosphere and by discharging its waste back into it. These activities are concentrated in the world's cities, most of which are in the coastal zone. Cities have 'ecological footprints' hundreds of times larger than the cities themselves. They import vast quantities of energy and material from their increasingly global hinterlands into the coastal zone where it is processed to satisfy consumer demands and is ultimately dissipated as waste. Current levels of consumption and dissipation are already "disordering" marine, coastal marine, and terrestrial ecosystems and, as urbanization accelerates, the destructive pressures will increase. This pathology is not responsive to better management techniques and technological fixes alone. Preserving the ecological integrity of the coastal zone requires that we vastly reduce material throughput, human populations or both. These objectives require policy initiatives and behavioural changes far beyond any seriously contemplated to date, including at the least, massive fiscal reform and abandonment of the consumer ethic.

Purpose and Context

The sub-theme of this conference is "coastal communities in the 21st Century." It is therefore my purpose to examine the dual role of coastal communities both in driving the deterioration of the coastal zone and in rehabilitating it. My general thesis is that population growth and rising material consumption in cities and urban regions, most of which are in the coastal zone (particularly if we include fresh water rivers and lakes), are the source of most of the resource- and pollution-related 'problems' plaguing the terrestrial and aquatic ecosystems along our coasts. At the same time, some properties of urban systems give them significant potential leverage in efforts to move society toward a more sustainable future. This paper starts from a dual premise: first, society has badly misunderstood the true origins and nature

of the so-called 'ecological crisis.' What we generally take to be more or less separate 'environmental problems' (fisheries collapses, climate change, sea level rise, deforestation, soil deterioration, ozone depletion, etc.) are, in fact, not the primary disease, but merely the closely-related symptoms of a much deeper and more systemic pathology, namely ***human ecological dysfunction***. This is the qualitative dimension of the global ecological crisis. Secondly, society does not fully appreciate the cumulative effects of so-called 'exponential' (geometric) growth and therefore underestimates the magnitude of the problem. This is the quantitative dimension of the ecological crisis.

For both these reasons, the range of private and public policy responses to 'environmental' and related global change problems falls far short of what is required to put society on a sustainable course.

Competing Visions of Reality[1]

Why do we have no consistent understanding of 'the problem' of global ecological decline? Many of the contradictions associated with sustainable development can be traced to the differing beliefs and assumptions about the nature of humankind-environment relationships held by various interest groups in society. These differing pre-analytic visions (or worldviews or cultural paradigms) define and delimit how their various adherents analyze significant problems and determine the scope, depth, and direction of their thinking about possible solutions. Each worldview or paradigm therefore produces an internally consistent but uniquely different behavioural or policy response to the problem. More importantly, most contain inadequate reflections of external reality.

Since we acquire our general worldview simply by living, growing up, and being educated in a particular socio-cultural milieu, we are often unconscious that we even have a worldview. Most of us are therefore unaware of the subtle ways it shapes our understanding of, and approach to, societal problems or that there are alternatives. For example, when we think that "the world is flat" was once a self-evident truth, it raises the unsettling possibility that much of even our present cultural worldview may consist largely of shared illusions! Indeed, I argue that the fundamental ecological dysfunction confronting global society today is an inevitable outcome of 'industrial expansionism' (the prevailing worldview of western industrial culture in the 20th Century) because it reflects a distorted and incomplete understanding of biophysical reality.

Many policy analysts and politicians argue that sustainability will require a 'paradigm shift' or a fundamental change in the way we do business, but few have thought through what this would actually entail. As a result, action to date translates into little more than improved regulatory regimes and better resource management programs. In contrast, the argument here is that: 1) while many of our 'environmental problems' do, in fact, stem from flaws in the industrial expansionist paradigm; 2) these flaws can be remedied only by a radical global shift in developmental philosophy and attendant policies toward an ecologically-oriented, economic steady state. In short, sustainability poses a far more serious challenge to many of society's most basic values and beliefs than most mainstream politicians, policy makers, and planners have been willing to acknowledge.

Source of the Problem: The Expansionist Paradigm

Industrial expansionism clearly occupies center-stage for most contemporary governments and development organizations. It is associated with neo-liberal (neo-classical) economic theory which treats the economy as an independent, self-regulating, and self-sustaining system whose productivity and growth should not be seriously constrained by concern for the environment (Figure 1). Adherents believe they have achieved mastery over relevant parts of the natural world and that future technology will be able to compensate for most natural resources depletion. Even the UN's ground-breaking World Commission on Environment and the Economy (the Brundtland Commission) can be placed in this camp. The Commission assumed that limits on the environment's ability to meet human needs were imposed, not by nature, but "by the state of technology and social organization" (p.43). Though they conceded future expansion would be

qualitatively different from present forms of growth, "a five- to tenfold increase in world industrial output can be anticipated before the population stabilizes [at about twice the present numbers] sometime in the next century"(WCED 1987, p.213).[2]

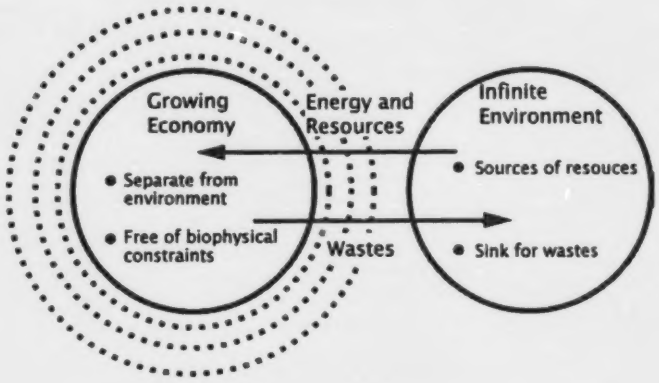

Figure 1. Expansionists treat the economy as an open, growing, independent system lacking any fundamentally important connectedness to a seemingly infinite "environment." They believe we can find technological substitutes for most resouces, and pollution damages can be controlled by 'internalizing' the costs (e.g. through pollution charges).

Prevailing economic rationality relies on the concept of free and open markets to ensure sustainability. This leads to the 'internalizing of the externalities' (pollution costs) and 'getting the prices right' as an essential first step. Many conventional economists place great confidence in price as an indicator of scarcity and on the mechanics of the marketplace to relieve it—rising prices for scarce resources are assumed automatically to lead to conservation of the affected resources and to stimulate the search for substitutes. And as Nobel Laureate Robert Solow has observed: "If it is very easy to substitute other factors for natural resources, then... The world can, in effect, get along without natural resources..." (Solow 1974, 11).

As suggested by the emphasis on money and prices, the conceptual starting point for conventional economic analysis is the "circular flow of exchange value" (Daly 1991, 195). Most economic textbooks feature a circular diagram of the economic process as "a pendulum movement between production and consumption within a completely closed system" (Georgescu-Roegen 1971). Value embodied in goods and services flows from firms to households in exchange for spending by households (national product). An equal value, reincarnated in factors of production, flows back to firms from households in exchange for wages, rents, profits, etc., (national income). Unfortunately, this model is problematic when it comes to assessing ecological sustainability since there is no connection in these money flows to biophysical reality. Indeed, "it is impossible to study the relation of the economy to the ecosystem in terms of the circular flow model because the circle flow is an isolated, self-renewing system with no inlets or outlets, no possible points of contact with anything outside itself" (Daly 1991, 196).

It follows that sustainability seems a simple business from the expansionist perspective. If there are no general environmental constraints on the economy and we can find technological substitutes for particular resources, then the shortest route to sustainability is to stay our present course. If we continue freeing up markets, privatizing resources and government services, and eliminating barriers to trade, a new round of growth in both rich and poor countries will provide the wealth needed both to redress poverty and inequity and to generate the economic surpluses needed, particularly in the developing world, to better

husband the natural environment see Beckerman 1974 for a full exposition). In short, " ...the surest way to improve your environment is to become rich" (Beckerman 1992, 491 as cited in Ekins 1993, 267).

Needless to say, the industrial expansionist paradigm places no special value on attributes of the coastal zone beyond those that can be detected and addressed in the marketplace. It simply assumes accumulating economic (human-made) capital value will exceed that of lost production and the life support services from deteriorating coastal ecosystems. Thus, while significant ecological and social costs in the coastal zone will result from material growth, it is suggested they will be outweighed by the benefits.

The Ecological (Steady-State) Alternative

By contrast, ecologists and ecological economists argue the true cost of 'progress' is not being, and cannot be, measured by conventional economic analysis. They argue that the assumptions and beliefs of conventional economics are responsible for, or at least seriously aggravate, the sustainability crisis. These analysts see the economy as an inextricably integrated, completely contained, and wholly dependent subsystem of the ecosphere (Daly 1992, Rees 1990) (Figure 2). Moreover, both the economy and the ecosphere are complex, self-organizing systems whose behaviour is ultimately governed not by the simple mechanics of neo-liberal economic analysis, but by complex ecosystem dynamics and thermodynamic laws. Indeed, the second law of thermodynamics, as applied to open far-from-equilibrium systems, provides an important theoretical and heuristic foundation upon which to build our economic environmental interactions.

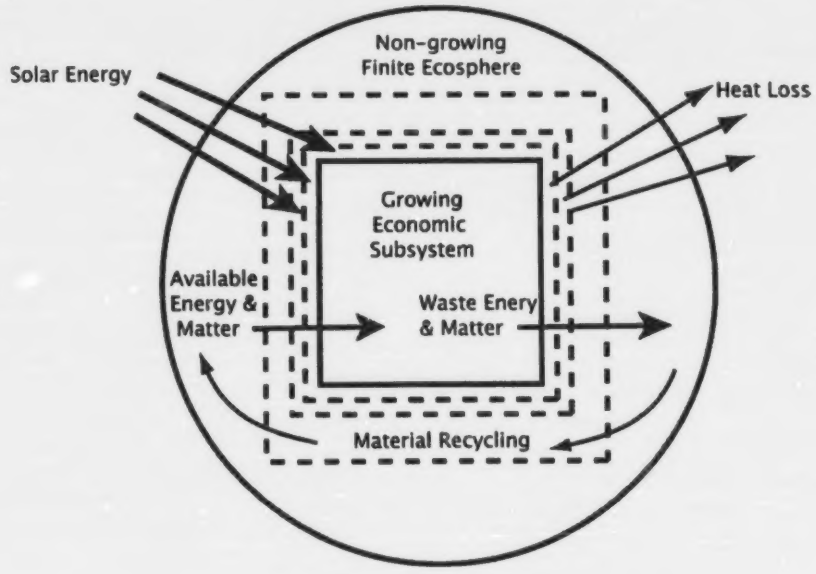

Figure 2. The ecological perspective sees the economy as an open, growing, wholly dependent subsystem of materially-closed, non-growing, finite, ecosphere.

Modern interpretations of the second law suggest that all highly-ordered, complex systems develop and grow (increase their internal order) "at the expense of increasing the disorder at higher levels in the system's hierarchy" (Schneider and Kay 1994, 2; see also Kay and Schneider 1994). In other words, complex systems maintain internal order and remain in a dynamic non-equilibrium state through the dissipation of available energy/matter extracted from the environment. The structural integrity of the local system is achieved at the cost of increased entropy of the global system within which the local system is imbedded. Because they feed upon and degrade available energy/matter from outside themselves, such self-organizing non-equilibrium systems are called dissipative structures (Nicolis and Prigogine 1977).

The human economy is a highly-ordered, dynamic, and far-from-equilibrium dissipative structure. Its internal order and complexity continuously increase as it grows and develops, particularly through the formation of manufactured capital made from available energy/matter 'imported' from the ecosphere. The "industrial metabolism" (Ayres and Simonis 1994) of the economy can thus be likened to biological metabolism. Like our bodies, the economy consumes energy and material produced by nature. It merely transforms the "available" portion of it into useful goods and services, and returns the entire material and energy flux to the environment as waste.[3]

Two implications of this dependent hierarchical relationship are particularly important in the present context: first, in thermodynamic terms, nature is the real producer; all economic activity involves material/energy consumption and invariably contributes to the human 'load' on the environment. Secondly, because the economy is a growing subsystem of the materially-closed non-growing ecosphere, beyond a certain point the increasing order of the former can be purchased only by increasing the disorder (entropy) of the latter. There are, therefore, real constraints on material growth: economic activity is ecologically sustainable only as long as resource consumption waste production by the economy is less than resource production and waste assimilation in nature.[4]

It then follows that the ecologically important transaction of the economy is not the circular flow of money, but rather the unidirectional and thermodynamically irreversible flow of useful matter and energy from the ecosphere through the economic subsystem and back to the ecosphere in a degraded form. This linear throughput is what fuels the economy—despite our technological wizardry, human society remains in a state of obligate dependence on the ecosphere for both the production of useable energy/matter and for waste.

Sustainability is clearly a more complex problem from the ecological perspective than from those in the economic mainstream. The economy, from the former viewpoint, is in a quasi-parasitic relationship with the ecosphere, ultimately dependent on material flows to and from nature, and on life support services, many of which are invisible to conventional monetary analyses. Money prices are therefore unreliable indicators of ecological scarcity, and can have only a limited role in fostering sustainability. From this conclusion, only the foolhardy would trust in markets and technology to find substitutes for such essentials as photosynthesis and climate regulation, the ozone layer and natural biodiversity. Finally, growth in national product (national income) is ultimately constrained by systemic limits on the flows of biophysical goods and services (natural income). Certainly when the economy has reached the maximum sustainable level of material throughput, flow rates should be held constant or in "steady-state" (Goodland 1991, Daly 1992).

In contrast to industrial expansionism, the ecological perspective recognizes coastal ecosystems as among the most important and productive on Earth. Indeed, while the total value of coastal ecosystems and processes is unmeasured (and may well be unmeasurable), it no doubt exceeds the value of the manufactured capital accumulating in the coastal zone. The case could even be made that as global change accelerates, the marginal economic value of current development in the coastal zone may well be less that the marginal ecological costs—the value of lost bio-productivity and life-support services—associated with that development. In this case, further material growth in the coastal zone is actually uneconomic.

On Human Ecology

It is obvious that development policies flowing from the above two differing paradigms will be as different as the paradigms themselves. The critical point is that any paradigm is only a conceptual model and the resultant policies can thus be only as good in coping with reality as the model represents reality. Significantly then, the prevailing industrial expansionist paradigm neither predicts our present ecological dilemma nor suggests viable solutions.[5]

By contrast, the ecological paradigm sees an erratic climate, large-scale resource depletion, widespread toxic contamination, and systems breakdown as the inevitable consequence of continuous material economic growth: global environmental problems are thus mere symptoms of fundamental human ecological dysfunction. Moreover, it seems that this dysfunction results from society's allegiance to the *expansionist industrial paradigm*, which sees humankind as largely independent of nature. It follows that if we are to reverse global decline and develop better policies for sustainability, we must do so from within an explicitly human ecological framework.

Eco-Footprint Analysis

As a first step, humans must recognize themselves as components of their respective ecosystems. Accepting this relationship will be difficult for technological 'man.' The latter are unaccustomed to thinking of themselves as biological beings let alone ecological entities. (The 'Cartesian dualism' permeating the modern industrial worldview, has created a barrier between people and the rest of nature, which prevents us from fully knowing ourselves.) Nevertheless, it is time to acknowledge that despite our technological, economic, and cultural achievements, the relationship of humankind to the rest of the ecosphere should be no different from that of the other species on the planet.

This insight implies that to understand the ecological niche of humans, we must study people as we do other plant and animal species. The important question is: what are the critical material relationships between humans and the other components of their supportive ecosystems? My graduate students and I have approached this question through 'ecological footprint analysis,' a method we developed to quantify the material and spatial dimensions of the human niche (Rees 1992, 1996; Rees and Wackernagel 1994; Wackernagel and Rees 1996). Ecological footprinting builds on traditional trophic ecology. We begin by constructing what is, in effect, an elaborate 'food-web' connecting specified human populations to the ecosphere. This involves quantifying the material and energy flows required to support that population and identifying significant sources and sinks. We consider the demands of both human and industrial metabolism.

Eco-footprinting is further based on the fact that many material and energy flows (resource consumption and waste production) can be converted into land- and water-area equivalents. Thus, the theoretical *ecological footprint of a specified population is the area of land/water required to produce the resources consumed, and to assimilate the wastes generated by that population on a continuous basis, wherever on Earth that land may be located.* It therefore includes the area appropriated through commodity trade and the area needed for the referent population's share of certain free land- and water-based services of nature (e.g., waste assimilation and nutrient recycling). In other words, ecological footprinting estimates the area of productive ecosystems all over the world whose biophysical output is appropriated for the exclusive use of a defined human population.[6]

How Big are our Urban Ecological Footprints?

Our early estimates, accounting for just food, fibre, and fossil energy consumption,[7] show that the ecological footprint of residents of high-income countries, range as high as six hectares per capita (Rees and Wackernagel 1996; Wackernagel and Rees 1996). More recent analyses push the upper estimate to 10 hectares per capita (Wackernagel et al. 1997).[8] By extrapolation, the ecological footprints of high-income cities is typically two to three orders of magnitude larger than the geographic areas physically occupied.

For example, assuming Vancouverites are average Canadians, the 472,000 generate an average ecological footprint of about seven hectares of land and water ecosystems per capita to support their lifestyles (Wackernagel et al. 1997). This means the aggregate eco-footprint of the city proper is 3,304,000 ha, or 290 times its political-geographical area (11,400 ha). Similarly, in a more comprehensive study, Folke et al. (1997) estimate the 29 largest cities of the northern European Baltic Basin appropriate an area of forest, agricultural, marine, and wetland ecosystems 565–1,130 times larger than the cities' area.

These data emphasize what should be obvious—that no city, as presently defined, can be self-sustainable. In ecological terms, cities and urbanized regions are intensive nodes of consumption sustained almost entirely by biophysical production and life-support processes occurring outside their political and geographic boundaries (Rees 1997; Rees and Wackernagel 1996). The modern high-income city resembles a parasite on the Earth's hinterland. Unfortunately, the separation of production in nature from consumption in cities renders urbanites blind to the degradation that results from their consumer lifestyles and unconscious of their increasing dependence on a deteriorating global resource base.

More Bad News About Cities

Urban regions not only appropriate an increasing share of global production but they also weaken the structure of the ecosystems supporting them. Most important, cities significantly alter natural biogeochemical cycles of vital nutrients and other chemical resources. Removing people and livestock far from the land that supports them prevents the natural recycling of phosphorus, nitrogen, other nutrients and organic matter back into farm and forest ecosystems. Thus, as a consequence of urbanization, local, cyclically integrated ecological production systems have become global, horizontally disintegrated, throughput systems, and ***much of the 'throughput' winds up contaminating the coastal zone.*** For example, instead of being returned to its source in the prairies, Vancouver's and Victoria's daily appropriation of Saskatchewan mineral nutrients goes straight into BC's coastal waters. Similarly, in their classic analysis of *The Metabolism of Hong Kong*, Newcombe et al. (1978) found that 2.4 million tonnes of human foodstuffs—half a tonne per capita—passed through the city's supply system annually. Most of the vital plant nutrients associated with this food flow is lost from the land, being discharged instead into the city's harbour where it contributes to an urgent pollution problem.

The Increasing Human 'Load' on the Coastal Zone

There are several reasons for emphasizing the eco-footprints of cities. To begin, population growth and rising material consumption in cities, has the greatest impact in the coastal zone and on major waterways hosting most of the worlds large cities. All else being equal, this concentration of people and settlements along our coasts should, in itself, raise concerns about the impact of continuously rising consumption and pollution on the integrity of coastal ecosystems.

But all else is not equal. We have shown that cities and urban regions have ecological footprints up to several hundred times larger than the cities themselves. Cities thus act as massive funnels into which energy and material resources from elsewhere in the world are poured and concentrated. The processing, use, and consumption of these resources returns an equal volume of degraded and often toxic waste back into the immediate environments of cities, at great cost to local ecosystems. In short, because most cities are in the coastal zone, and cities concentrate material throughput and waste production, coastal ecosystems bear a vastly disproportionate share of the impacts of economic production/consumption.

Upping the Urban Ante

This bodes ill for prospects of maintaining coastal integrity. By early in the coming decade, most people on Earth will be living in cities. For the first time in the two million year history of our species, the immediate human environment for most of us will be the 'built environment.'

Moreover, while fifty per cent urban is an important demographic milestone, the process is by no means complete. Urbanization is actually accelerating in much of the world. From 1950 to 1990, the world's

urban population increased by 200 million to about 2 billion, annually adding an average of 1.1% of the 1950 level. In the 1990s, the pace of urbanization picked up. The world's urban population is expected to grow by about 50% in this decade, to almost three billion by 2000. By 2025, the UN projects that about 5.1 billion people will reside in cities, an increase of 70% in the first quarter of the Century (UN, 1994; UNDP 1998). This means that in the next twenty-seven years, ***the urban population alone is expected to grow by the equivalent of the total human population of about 1930.***

Not only are there more cities, but existing cities are getting bigger. In 2015, almost 17% of urban dwellers will live in large cities of over five million and there will be seventy-one such mega-cities by 2015. Significantly, most urban growth will occur in the less-developed countries which are by definition less-well equipped to cope. The third world is projected to have 114 cities of over four million in 2025, up from thirty-five in 1980 (UNDP 1998). Of the forty-four cities with between five and ten million inhabitants in 2015, some 36-39 will be in the developing world; finally, in 1950, the only city to exceed ten million people (New York) was in a developed country. However, by 2015, twenty-three of the twenty-seven cities expected to reach this size will be in less developed countries (UN 1994).

Many cities in the developing world are ill-prepared to accommodate this wave of newcomers. In the mid 1990s as many as 25% of urban dwellers in the developing world did not have access to safe potable water supplies and 50% lacked adequate sewage facilities. Accordingly, the World Bank estimates that developing countries alone will need to invest $US200 billion a year in basic infrastructure in the period to 2005, most of it for urban regions. Given anticipated urban population growth and material demand to 2025, "...it would be reasonable to expect the total volume of investment [in infrastructure] to reach $6 trillion by that time" (NRTEE 1998: 11).

Keep in mind, the world must construct new physical plants to support an urban population increase, in just the next 27 years, equivalent to the total accumulation of people in all of history up to the 1930s! Thus, in addition to basic infrastructure, the world's cities will construct millions of new dwelling units, stores and offices; thousands of new schools, hospitals, and water and waste-water treatment plants; countless square kilometers of roads and parking facilities for tens of millions of additional motor vehicles; and all manner of supportive transportation, communications, and related urban infrastructure. (In effect, we will be doubling the 1970s' urban presence on the planet.) On the face of these data, it is little wonder that most people expect cities to be "using much more energy,[materials,] water, and land than ever before and doing so in more concentrated, land-, capital-, knowledge-, and technology-intensive ways" (NRTEE 1998: 2).

Let's explore this 'expectation' in a little more detail. The current global development path projects world economic output at least to double and double again by 2050. This would require an average annual increase of just 2.8% in gross world product (somewhat lower than the average growth rate over the past 50 years). Assuming that material and consumption is closely associated with GDP/capita, geometric growth implies that the quantity of resources to be consumed in the next 25 years is potentially greater than the total volume of resources consumed in the entire 20th Century. Similarly, in the 25 years between 2025 and 2050, resource consumption could equal total consumption in the previous 125 years.[9] Implicit in this trend is the potential for waste and pollution loadings in the next 25 years to exceed total discharges of the 20th Century. Once again, society does not fully understand the implications of its favoured 'exponential' growth model of development. Consequently, we generally underestimate the magnitude of the ecological problems confronting us.

Facing Physical Reality

We have made the case that pressure on coastal resources and waste sinks are likely to increase well beyond policy-makers' expectations in coming decades. Cities are huge and growing 'dissipative structures' that concentrate energy/material consumption and waste generation in the coastal zone. Even current levels of resource exploitation and discharge seriously compromise the natural productivity and

biodiversity of both aquatic and terrestrial ecosystems in the coastal regions of most continents. With accelerating coastal urbanization (particularly in the developing world), and the anticipated doubling of gross world product in the next 50 years, prospects for conserving our remaining coastal resources and ecosystems seem rather dim. Indeed, analysis suggests that if we are to significantly improve matters we must reduce both the material throughput of the economy and human populations.

However politically unfeasible the reductions in both the economy and human populations may seem today, analysts are beginning to acknowledge that they are general requirements for sustainability. For example, various studies suggest that a *per capita* reduction in material consumption of 80% or more in high-income countries may be necessary to create the 'ecological space' needed to enable developing country populations to attain materially acceptable living standards (see Carley and Spapens, 1998 for a comprehensive argument). Even the Business Council for Sustainable Development has agreed that "industrial world reductions of over 90% in material throughput, energy use, and environmental will be required by 2040 to meet the growing world population needs fairly within the planet's ecological means" (BCSD 1993).[10]

Urban Leverage: The Good Ecological News About Cities

While cities and urbanization are at the geographic source of the problem, the very factors that make cities weigh so heavily on the ecosphere—the concentration of population and consumption—also gives them great economic and technical leverage in the quest for sustainability. Mitlan and Satterthwaite 1994, and Rees and Wackernagel 1996 note that the advantageous economies of scale and agglomeration economies of urban settlements result in:

- lower costs per capita of providing piped treated water, sewer systems, waste collection, and most other forms of infrastructure and public amenities;
- a greater range of options for material recycling, re-use, re-manufacturing, and a concentration of the speciaized skills and enterprises needed to make these things happen:
- high population densities which reduce the per capita demand for occupied land;
- greater possibilities for electricity co-generation, and the use of waste process heat from industry or power plants, to reduce the per capita use of fossil fuel for space-heating;
- numerous opportunities to implement the principles of low through-put 'industrial ecology' (i.e., the creation of closed-circuit industrial parks in which the waste energy or materials of some firms are the essential feed-stocks for others); and
- great potential for reducing (mostly fossil) energy consumption by motor vehicles through walking, cycling, and public transit.

Thus urban communities, and coastal communities in particular, have a special role to play in reducing pressures on global land and water ecosystems of the coastal zone. They also have the political clout to ensure implementation of the policy reforms necessary for effective action.

Ecological Fiscal Reform

Various studies show that to achieve these urban economies, and to move them toward massive reductions in energy and material use, appropriate economic incentives must be in place. Before reform can take place we must understand, first, that much of today's economic and material inefficiencies derived are because the market prices do not reflect resource depletion or pollution damage costs of economic goods and services. Secondly, government programs designed for regional development or stabilization purposes often various economic incentives which promote over-use or over-harvesting.

Global ecological economics argues for restructuring of economic incentives and taxation policy to encourage material and energy conservation and to increase labour demand. A full slate of reforms would replace present subsidies to industry by a system of resource use and depletion taxes, marketable quotas,

etc., off-set by corresponding reductions in other taxes, particularly on labour (Brown, et al. 1991; von Weizsäcker and Jesinghaus 1992; Young and Sachs 1994; Roodman 1997). These policy reforms are necessary to drive a wedge between consumption of goods and services and use of energy and materials, while maintaining material quality of life (Pearce 1994 and Figure 3). In theory, by raising input costs closer to the full social cost of providing goods and services, taxes on energy and resources would create an incentive for industry to develop efficient technologies. This could decrease total material throughput while maintaining the overall 'service' level provided by the material and energy that is still consumed. Enhanced resource productivity would also constrain consumer price increases thus limiting the impact of reform on people's capacity to consume.

Resource and pollution taxes should be increased on an accelerating schedule while income, payroll, value added, and similar taxes are reduced in the same gross amount (to maintain revenue neutrality).[11] At present, income, payroll and related taxes increase the upward pressure on wages and salaries. This reinforces an already undesirable incentive for industry to displace labour with energy and machinery which, in turn, increases resource use and pressure on the environment. Raising resource taxes while reducing income and payroll taxes would reverse the incentives, helping both to reduce consumption of energy and material and to stimulate employment.

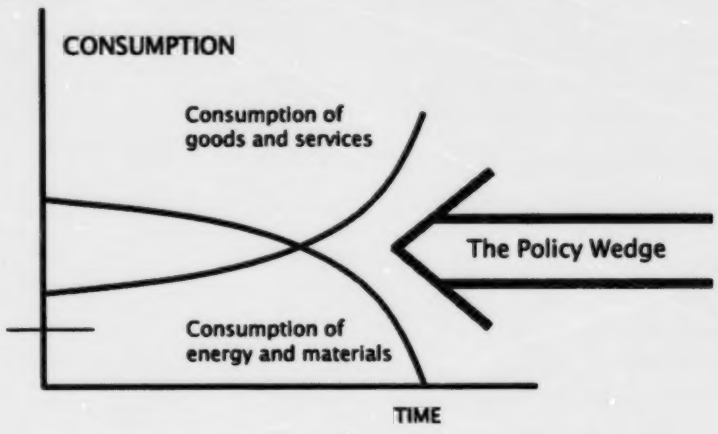

Figure 3. At the limits of material throughput, sustainability requires that growth in the consumption of goods and services be accompanied by a proportional decline in the energy and material intensity of that consumption. (Figure adapted from Pearce 1994.)

Of course, none of this will happen unless there is adequate public pressure to implement the needed reforms. Admittedly, mustering the required support will be difficult for a society which has made a cult of free-market economics and which is currently reveling in an era of anti-government rhetoric.

Epilogue

Coastal regions are experiencing increasing stress worldwide from over-harvesting of coastal resources, urbanization and other uncontrolled development of coastal lands, and increasing chemical pollution. These are serious issues that must be attended to. However, all such pressures on coastal ecosystems are largely the symptom of human ecology gone awry as manifested by continuous population growth and geometric economic expansion.

If the ecological perspective on humanity-ecosphere interaction is correct, the situation is likely to get substantially worse before it gets better. The recent massive die-off of corals in the Indian Ocean basin, and the collapse of kelp 'forests' off coastal Alaska,[12] are illustrative of the increasingly large-scale systemic impacts human activity will have on coastal ecosystems, given prevailing development policies.

The problem is that humans have become the ultimate consumer organism. Other consumer species occupy fixed specific niches within their respective ecosystems, and their constrained patterns of consumption may actually be essential to maintaining the overall integrity of the entire system (sea otters appear to be such a 'keystone' species in maintaining the integrity of normal kelp forests [see Note 12]). By contrast,'technological man' occupies an ever-broadening niche within most of the world's ecosystems, with few social constraints on human population growth, and virtually none on material consumption. Indeed, we have made a fetish of consumerism and created a socio-economic system dependent on material growth. Humans are therefore invariably destructive to other species and to the overall integrity of the ecosystems whose production we increasingly appropriate.

In this light, the long-term solution to ecological problems in the coastal zone has little to do with improved resource management or better stewardship of coastal ecosystems *per se*. The ultimate solution resides in a profound shift in the fundamental assumptions, beliefs, and values that underpin industrial society and our consumer lifestyles. Paradoxically, then, those who would save the coastal zone might find their time best spent in lobbying for appropriate fiscal reforms and in developing the social therapies needed to free society from its potentially fatal addiction to consumption.

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Endnotes

[1] This section based on Rees 1995.

[2] Ironically, some members of the industrial expansionist school regard the Brundtland Commission as being excessively concerned about the state of the natural world (see Nordhaus 1992). Being seen by conservative economists as relatively radical and by hard core environmentalists as excessively conservative, is evidence of the fine line walked by the Commission and of the ambiguity inherent in the "sustainable development" concept it popularized.

[3] Even the final products of the economy—all consumer and capital goods—are eventually discarded as waste.

[4] Industrial society's failure to meet this condition is a sufficient material explanation of the present ecological crisis.

[5] On the contrary, prevailing policies assume a five- to eight-fold expansion of industrial activity which can only exacerbate the problem in the future.

[6] In practice, only a limited number of wastes (e.g., carbon dioxide, plant nutrients such as nitrates and phosphates) can readily be converted to land area equivalents with present knowledge. Some contaminants such as ozone-depleting chemicals cannot be included at all in eco-footprint analysis.

[7] The food category includes both a terrestrial (crop- and grazing land) and marine component, the latter based on seafood consumption. The fossil energy component is based on the area of dedicated carbon sink forest that would be required to assimilate carbon dioxide emissions.

[8] There are only two hectares per capita of productive land and water on the planet. Consumption by the wealthy thus claims several times their fair earth-share.

[9] These approximations are based on the fact that under conditions of geometric growth, the increase in each doubling period is greater than the sum of increases over all previous doubling periods.

[10] Wackernagel and Rees (1996) and Wackernagel et al. (1997) estimate that with prevailing technologies and average consumption levels, the present world population exceeds long-term global carrying capacity by up to one third. This means, in effect, that the wealthy 20% of the world's population who are responsible for 80%+ of private consumption have appropriated the entire carrying capacity of Earth for themselves.

[11] It makes good economic and social sense to tax the "the bads" (pollution) more than "the goods" (jobs and labour).

[12] Coral bleaching is likely due to excessive ocean water temperatures accompanying global warming. The kelp forests are being destroyed by an explosion of kelp-eating sea urchins caused by the collapse of sea otter populations (their most important predator). The sea otters, in turn, are being consumed by orcas (killer whales) apparently out of desperation. The orcas's normal prey, seals and sea lions, are disappearing as fish stocks decline because of human over-fishing and rising ocean temperatures.

CAN INTEGRATION WORK? EVALUATING THE EFFECTIVENESS OF COASTAL MANAGEMENT

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Introduction

The focus of this paper is close to the concept of integration, and questions of public policy and a question of law. We need to move towards changing our institutions (see Rees, 1999) so that integration is built into our management structure; a most important concept. The conference theme is integration of social, economic and ecological factors. In the United States the *Coastal Zone Management Act* was passed in 1972. It called for an integrated approach. In 1980 the act was amended to add a series of specific objectives that constituted the factors that are to be considered in doing an integrated approach to coastal management. So the question we now have, after 20 years of implementation experience, is: How well are the individual states and the country doing in achieving integration? How are they meeting the specific objectives that are outlined in the *Coastal Zone Management Act* (CZMA)? To try to answer this question and to also provide more of a perspective on the process, the Coastal Zone Management Effectiveness Study was undertaken. It was done between 1995 and 1997, and was funded by the Office of Ocean and Coastal Resources Management within NOAA. It was undertaken by six investigators in the United States at three different Sea Grant universities. The paper I am going to present reports on that study and it's conclusions.

What we conclude is that the CZMA is conditionally effective in implementing its objectives but this varies widely across objectives and among the states themselves. Presented here is a broad overview of this study. In addition, there are five specific papers on selected coastal management topics. The overview and five papers will be published in a theme issue of the journal Coastal Management (Volume 27, Nos. 2/3, 1999).

The Coastal Zone Management Act

The broadest goal of the United States' *Coastal Zone Management Act* is to upgrade state capacity for coastal zone management. Prior to the Act's enactment, individual states were viewed as the weak link between local government that dealt with land use controls and economic development, and federal agencies that were concerned with resource protection and resource management. States are to achieve wise use, which meant full consideration of ecological, cultural, aesthetic, and historic factors as well as compatible economic development. All was to be accomplished within a single management program. The Act clearly set out the goal of integration, however, a number of specific objectives were added to the Act in 1980 to further specify goals within the integrated approach.

Figure 1 provides an overview of the framework of the Coastal Act for coastal management in the United States. The most important link is the State Coastal Management Program, which integrates between their own program, and that of users and other governmental agencies.

There is a failure in integration at the federal level, although one function of the national Coastal Zone Management Program is to build the linkages between other agencies (e.g. Corp of Engineers, the Environmental Protection Agency, Fish and Wildlife Service, etc.) where there is more money and more personnel working on these issues than within the lead agency. Perhaps greater integration will occur with the current effort towards developing a national oceans and coastal policy.

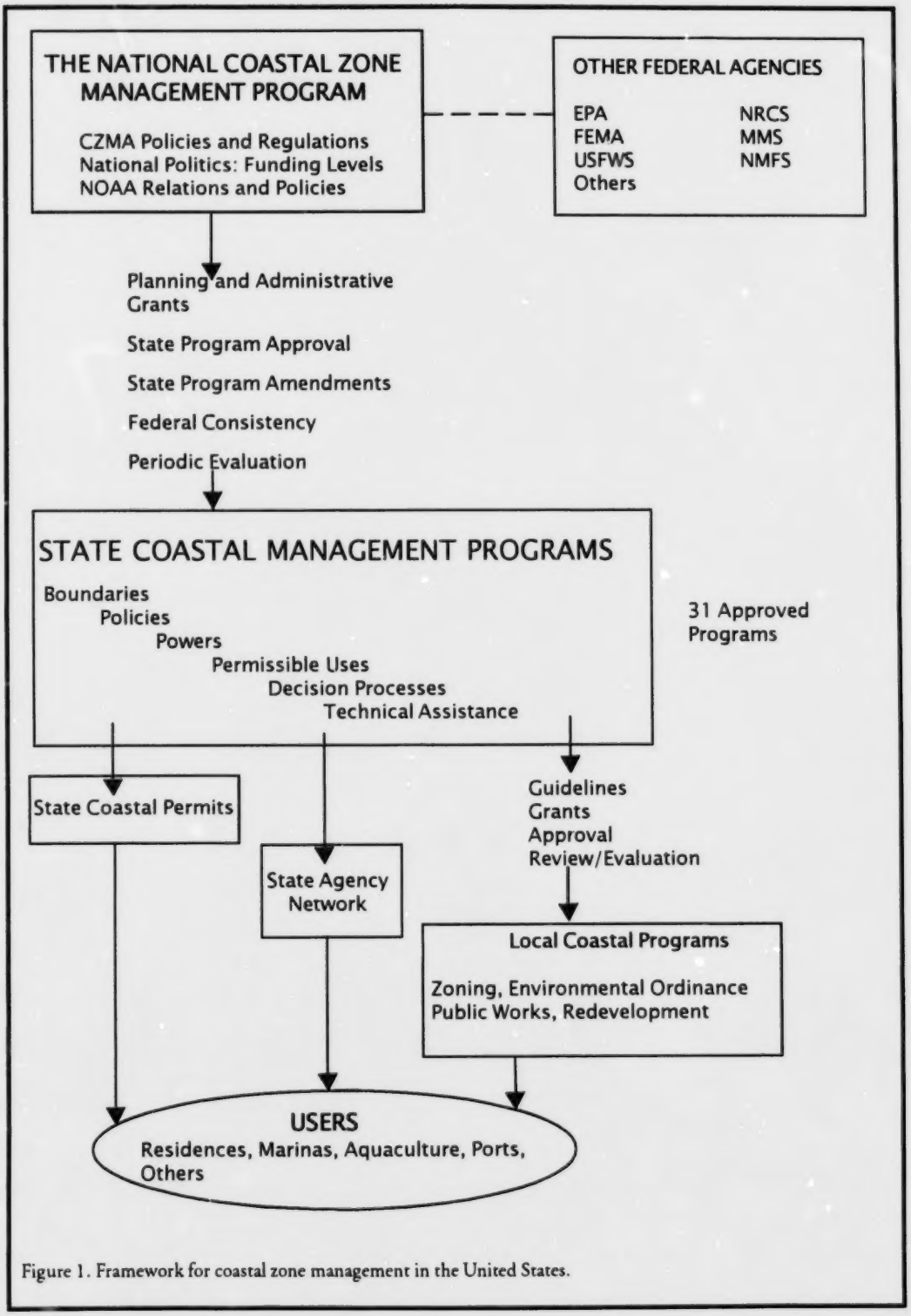


Figure 1. Framework for coastal zone management in the United States.

We now have 32 approved state coastal management programs of the 35 eligible states. The state defines a framework for coastal management by identifying where the coastal zone is, the policies that will apply, the powers to be used to implement policy, permissible uses, a decision-making process, and technical assistance. They can operate through local coastal programs, through a network of existing agencies, or in some cases, the state will administer their own permit systems within the coastal zone. One difficulty in evaluating coastal management in the United States, relative to federal goals, is that there are 32 individual programs, each with their own policy framework, powers, and permissible uses.

The Coastal Zone Effectiveness Study

The structure of the Coastal Zone Management Effectiveness Study attempts to deal with the complex problem of assessing 32 separate state programs. Figure 2 provides a broad overview of the methodology used. Data are collected a number of categories that yield state profiles, an assessment of how well each state is doing, a summary of a particular issue area, and finally, national conclusions. The broad research question addressed was how effective are state management programs, individually and collectively, in addressing the core objectives of the national Act. Effectiveness is defined as the impact of the state program on the core objectives laid out in the federal Act as measured by outcome indicators supplemented with process indicators along with issue-important factors. The core objectives describe the elements to be integrated:

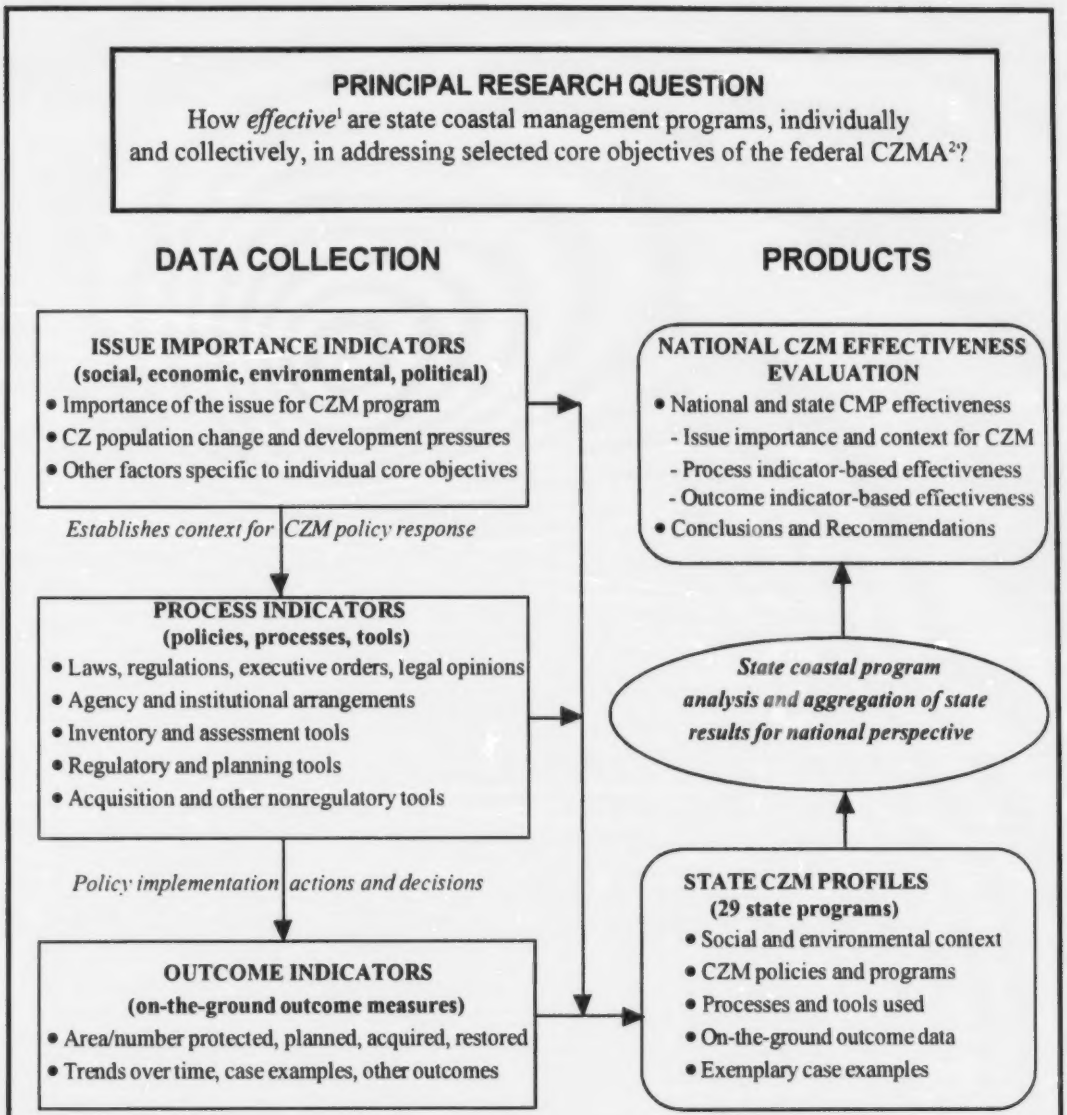
- the protection of natural resources including wetlands, estuaries, beaches, dunes and rocky shores, as well as fish and wildlife and their habitat;
- priority consideration for coastal dependent uses and the revitalization of abandoned waterfronts, addressing some of the urban issues of Rees (1999);
- the provision for public access;
- management of coastal development to minimize loss of life and property due to development in hazardous areas; and
- co-ordination and simplification of governmental decision-making.

This suite of objectives, implemented in some combined form, would allow the state to meet the integration objectives of the federal Act. We examined only the first three objectives.

Weighting factors or indicators was accomplished by understanding the social and environmental context of each coastal program. Each state has their respective set of problems, and thus make political decisions about which problems should be addressed first. For example, within the area of protection of natural resources such as wetlands and estuaries, the degree to which there has been wetland loss was an issue important factor. We thereby gave more weight to the amount of protection given wetland protection and enhancement in those states where there had been significant loss.

The policies, processes, and tools used by each state in attempting to achieve their respective objectives was then evaluated in order to determine potential effectiveness of the coastal management program. Potential effectiveness was evaluated with the development of a combined "best model" for a particular issue-area. By assessing all tools and processes used in all states for a single issue, say protection of wetlands, and then assessing the relative importance that each state puts on those tools, permitted the development of the best set of tools. Each state then was evaluated against the model. This led to conclusions about potential effectiveness, i.e. whether a state has the tools to accomplish its objective.

Finally, what turned out to be the biggest difficulty in the study was to create on-the-ground outcomes; that is, what results can be attributed to the state coastal program in a particular issue- area. For example, for wetlands protection, how many acres are protected, acquired or restored because of coastal program actions? Or, over the last five years, what has been the rate of change (either reduction or increase) in the amount of protected wetlands?


PRINCIPAL RESEARCH QUESTION
How effective[1] are state coastal management programs, individually and collectively, in addressing selected core objectives of the federal CZMA[2]?
DATA COLLECTION
PRODUCTS
ISSUE IMPORTANCE INDICATORS
(social, economic, environmental, political)
• Importance of the issue for CZM program
• CZ population change and development pressures
• Other factors specific to individual core objectives
Establishes context for CZM policy response
PROCESS INDICATORS
(policies, processes, tools)
• Laws, regulations, executive orders, legal opinions
• Agency and institutional arrangements
• Inventory and assessment tools
• Regulatory and planning tools
• Acquisition and other nonregulatory tools
Policy implementation actions and decisions
OUTCOME INDICATORS
(on-the-ground outcome measures)
• Area/number protected, planned, acquired, restored
• Trends over time, case examples, other outcomes
NATIONAL CZM EFFECTIVENESS EVALUATION
• National and state CMP effectiveness
- Issue importance and context for CZM
- Process indicator-based effectiveness
- Outcome indicator-based effectiveness
• Conclusions and Recommendations
State coastal program analysis and aggregation of state results for national perspective
STATE CZM PROFILES
(29 state programs)
• Social and environmental context
• CZM policies and programs
• Processes and tools used
• On-the-ground outcome data
• Exemplary case examples

* The model was developed by Professor Jim Good, in consultation with the research team.

1 *Effectiveness* is defined as the impact of state CMPs relative to national core objectives. *Effectiveness* is determined by the evaluation of on-the-ground outcomes of policy implementation, supplemented by analysis of process indicators and issue importance information. Where outcome data are lacking, process indicators are used as surrogates to estimate effectiveness.

2 CZMA Section 303(b) core objectives for the state coastal management programs examined in the national study included (1) protecting beaches dunes, bluffs, and rock shores, (2) protecting estuaries and coastal wetlands, (3) providing for public access, (4) promoting seaport development, and (5) revitalizing underutilized waterfronts.

Figure 2. General model for evaluation the effectiveness of the U.S. National Coastal Management Program.*

In summary, three important factors; issue importance, processes and tools their potential effectiveness, and outcomes related to the tools were used to assess the state's program. This resulted in a set of products for each of the five subjects examined. Profiles were written for each subject and for each state, resulting in 150 state profiles now filed with the Office of Ocean and Coastal Resource Management in NOAA. National assessments were written on wetlands, beaches and dunes, waterfront revitalization, public access, and seaport development. The development of national conclusions ended the evaluation.

Wetlands and Estuary Protection

General conclusions about the topic of protecting estuaries and coastal wetlands are provided to give further insights. Unfortunately, less than half the states have sufficient data for even a probable-effectiveness determination, and in only two states could we make conclusive effectiveness-determinations. The data on trends in wetland protection were unavailable, and, in addition non-tidal, wetland management was a relatively weak function and non-regulatory restoration an under-used tool. This has led to recommendations for both policy change and policy enhancement.

Below is an example of the outcome indicators used to make judgements about effectiveness in the wetland protection category. The area of annual-permitted-loss per year as a percent of regulated wetlands is considered a regulatory outcome indicator. Other outcome indicators include planning, acquisition, and non-regulatory restoration of wetlands. Each state was ranked high, moderate or low in meeting any single objective. We were then able to come up with an index of the relative amount of change in wetland acreage and whether the level of protection was low, moderate, or high. In the area of wetland compensatory mitigation as a percent of all losses, a value >90% mitigation, was considered a high rating and <75% compensatory mitigation was low.

Looking at all factors involved in the assessment of wetland protection, only two states had sufficient data to allow assigning a high outcome indicator rating. There were only about 10 states for which there was enough data to make "probable" outcome determinations. There is thus a real weakness in the information being collected to allow an assessment of coastal management decision making in the United States. This 20 year old program requires reform in outcome monitoring.

Urban Waterfront Revitalization

One other study reported was that of urban waterfront revitalization. Here the count was better. The study identified 303 waterfront districts in United States' cities that received coastal zone management program funds, and technical assistance, or policy change to promote improvement in waterfront revitalization. It was concluded that, on average, these districts were half-way to completing their revitalization plans. And furthermore, that the $30 million in CZM attracted approximately $430 million in non-CZM funds; a 1:14 ratio.

Two types of outcome indicators were used. The first was the stage of waterfront revitalization achieved, and the second was the scope of revitalization. Stage is a measure of the number of projects underway and the level of infrastructure improvement. This was based on a fully revitalized waterfront, which became the standard against which the remainders were judged. Scope of revitalization measured the incorporation of CZM, e.g. public access in terms of parks, plazas, boardwalks, and the incorporation of marine activity. One major accomplishment of CZM in the United States has been to ensure that redevelopment includes water dependent marine activity, historic and cultural conservation, land-based economic activity that serves public access, as well as environmental clean-up and restoration.

The author developed a rating system that identified the stage of development as either advanced, middle or early to assess how states compared in meeting their waterfront revitalization goals. A classification system reflecting the scope of revitalization was also developed. Those states with the

broadest scope are achieving the most integrated form of revitalization. It will be interesting to revisit this process in 10 years to discern progress in relation to the study year of 1996/97.

Other Objectives

Finally, conclusions found for the other objectives are given briefly below. First, beaches and dunes; how well are coastal programs protecting beaches and dunes within the United States? Here we have the least conclusive results because of conflicting policies and private property rights issues. The regulatory control most frequently used in these areas are coastal setback regulations. However, setbacks have many exceptions, which undermine the concept of setbacks in the first place. Sixteen of twenty-two setback laws evaluated allowed uses such as single family homes, small lot development, infilling requirements, etc. However, the fact that there is a set of setback laws illustrates how integration occurs in coastal zone management. Public recreation is a CZM goal, but it detracts from the setback requirements protecting beaches and resources.

Investigators studying public access found movement away from acquisition and regulation, and towards education and technical assistance. For example, they found that the provision of liability waivers to land owners providing public access easements, was a useful tool. In Massachusetts there is a *pro-bono* attorney clearing house for coastal access. In Rhode Island, there is a right-of-way discovery program involving legal historical research. Finally, access signs, logos, and guidebooks are vehicles for educating the public about access opportunities.

The final topic evaluated was seaport development where only twelve of twenty-nine states gave detailed attention to seaports in their program. This suggests that coastal-dependent, economic development is not getting the same level of attention as public access or wetland protection. The twelve states considered 'port active,' specified sites for development and facilitated ports through expedited permit review or with financial incentives. Seaport development is an integral part of San Francisco Bay's conservation and development plan and is an excellent example of integration of development with CZM.

Our overall conclusion is that coastal management programs are conditionally effective in implementing the five CZM objectives examined. This is based on the policies, processes and limited outcome-data available for assessment. To reiterate, effectiveness was defined as outcome, supplemented with process- and issue-importance ratings. However, there are insufficient data for a systematic outcome-based performance evaluation of state CZM programs. The primary reason is a lack of an identified and predefined set of outcome indicators. If the community hasn't worked together to determine objectives, then one cannot determine success. Even at the state level, it was difficult to determine whether they met their goals because of the lack of outcome indicators identified. Thus, in the United States, a set of outcome indicators must be developed to link state management activities to the national CZM objectives. Only then can a performance evaluation system be designed.

I conclude with comments about integration in CZM, which should be required by law. The *Coastal Zone Management Act* in the United States established integration as a goal from the outset. Integration occurred via institutional design that required horizontal and vertical linkages. The vertical linkages of the CZMA system are sound. The money flowing among federal, state and local levels enhances integration. Similarly, the agreement between federal and state agencies creates integration. This is not true for horizontal integration at the national level. At the state level there are signs of horizontal integration among selected state agencies.

Some governmental mechanisms enhance integration, e.g. Special Area Management Plans (SAMP). In a limited geographic area with high levels of conflict a specific coastal land use plan is prepared to balance economic and preservation needs. Also, a number of states require environmental protection plans that

proceed in parallel with the development of port projects. Massachusetts, for example, has a good structure for planning within the broad confines of coastal management.

Future coastal management assessments should emphasize integration outcome indicators. These of course are different from outcome indicators for wetland protection. That is, you can count acres of wetland protected, or the number of districts that have revitalized waterfronts. But if you are asked to count the achievement of integration it becomes more difficult because it is a process of decisions, that cannot be easily quantified. Nevertheless, effort is needed to show in specific terms how CZM programs bring about the "balanced" and "wise use" called for in the Federal Act.

EVERYTHING I'VE ALWAYS WANTED TO SAY ABOUT THE PREDICTIVE MODELS USED FOR ENGINEERING DESIGN OF NOURISHED BEACHES.

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Introduction

Mathematical models are used with ever increasing frequency in both earth science and engineering. Such models have proved valuable in "academic" science for sorting out huge amounts of data and for determining the relative importance of natural parameters in earth surface processes. Applied modeling to predict the evolution of the earth's surface for engineering purposes is another matter and it is these engineering models that are the subject of this paper.

Beachfront dwellers have created a great demand to solve the erosion problem on the Great Lakes and open ocean shorelines. Coming to the aid of these besieged citizens are a special breed of civil engineers known as coastal engineers. This specialty has developed great skills in building structures capable of halting, at least temporarily, the inexorable retreat of the shoreline that threatens their customers' buildings. In this, they have found a great deal of success.

Shoreline structures built of concrete, steel, wood and stone can be designed by the same procedures that other civil engineers use to design bridges and elevated water tanks. Mathematical models and vast tables of strength data based on long experience are available as an aid in predicting the storm response and failure conditions of seawalls, revetments, breakwaters and groins. And, in case the models have problems, large safety factors can be built in. Problems arise mainly because the nature of future storms and the accompanying waves are always unknown.

During the 1960's beach nourishment rather abruptly became an important method of shoreline stabilization in the US as a political response to the damage done to shorefront buildings in the 1962 Ash Wednesday Storm along the US east coast (Pilkey and Dixon, 1996). Beach nourishment design requires a close understanding of beach behavior. Cost/benefit ratios and long-range community economic planning require good estimates of what a community should pay to keep a beach in place over the years. Suddenly coastal engineers were faced with quantifying a natural environment without the use of the widely understood parameters of steel and concrete.

One of the reasons that beach nourishment has become the "wave of the future" in shoreline management is that the walls built by the earlier generations of engineers were clearly responsible for the destruction of beach quality in tourist communities whose very existence depended upon beaches. The classic example of this problem became the northern coast of New Jersey, especially between Asbury Park and Seabright, where after more than 100 years of "hard" stabilization, the beach was gone.

The coastal engineering community, coming from the standpoint of individual customers with a need for a seawall, strongly resisted the notion that seawall construction was related to beach degradation. Beginning in the late 1980's however, engineers began to acknowledge the role of walls in beach destruction. Starting in 1985, certain states began to outlaw hard stabilization in any form, a move certain to further increase demand for nourishment. Today, Maine, Rhode Island, North Carolina, South Carolina, Texas and Oregon effectively prohibit hard stabilization. This added impetus to the role of beach nourishment in North American coastal management

As the coastal engineering community stepped into beach nourishment design, they carried with them the mathematical techniques that worked so well in the design of steel and concrete structures. Making many simplifying assumptions, engineers, led by the US Army Corps of Engineers, began to study and quantify beach processes in order to predict the behavior of beaches. But beaches differ from steel beams in a number of ways:

- Beaches are not well understood;
- Beaches are very complex; and
- Beaches are in chaos.

To make up for the lack of knowledge about beaches and the difficulty of obtaining data from this high energy environment, coastal engineers have depended heavily on wave tank studies. But wave tanks produce simple monochromatic waves without bottom currents, and do not come close to the highly dynamic and extremely complex nature of storm surf zones in nature. Large Wave Tanks (LWT's) are often assumed to be "the prototype," meaning that if a model correctly predicts profile changes in a tank, the model's veracity in the real world has been demonstrated (Komar, 1998).

At this point it is important to note again that this paper is about mathematical models used for coastal engineering purposes. Academic modeling is another matter and has different objectives and societal impacts.

Model Examples

An example of relatively simple analytical models are the renourishment factors (Krumbein and James, 1965) used to estimate the amount of sand needed for a nourishment project based on the grain size of the new sand. But, it is important to point out that the renourishment factors (USACE, 1984) are based on the non-existent assumptions that a certain type of wave condition will result in a certain grain size; i.e. when a beach is nourished, the sorting effect of waves will bring the "fill" sand back to this magical original "native" grain size. This assumption is wrong.

Beach nourishment design depends on the relationship between wave height and beach changes. These relationships are not well understood, much less quantifiable. More importantly, nourishment design is generally realistic shoreline wave conditions. Deep water wave height is hindcast on the basis of known weather conditions and then "brought ashore" or transformed into shallow water. One is required to accept a number of weak assumptions for this transformation. Furthermore, the impact on the shallow wave conditions of the simultaneous storm swell, produced by storms that are hundreds or thousands of miles away, is not considered. Average wave height is often measured as the highest one-third of the calculated annual wave heights, and storm waves are often measured by some extreme occurrence such as the highest 12 hours of wave height in a year's time. But the best measure to characterize wave conditions for a given beach is not known.

Determining the volume of sand transported in the surf zone by longshore currents is usually done using some variation of the so-called longshore transport equation which is sometimes referred to as the CERC equation (USACE, 1984). This equation never produces a volume that corresponds to volumes obtained by sand traps, tracer studies or groin-jetty impoundment studies. It should be noted that these direct measure methods for longshore transport volumes are not accurate in themselves (Bodge and Kraus, 1991).

To correct the difference between measured and calculated longshore transport sand volumes, a coefficient called the K factor is used. The assumption is that K is a constant for every beach; it is thereby multiplied

by the sand volume to obtain the "correct" volume. The most widely used number is 0.78, which was derived from four, 14 hour transport measurements in California and Gulf of California swash zones. Most North American longshore transport volumes used in beach design are determined with this K factor. Actual attempts at measuring K, by comparing measured and predicted volumes (e.g. Wang et al., 1998), have resulted in K's varying by two orders of magnitude (0.02 to 1.12). The astounding thing about the longshore transport equation is that as engineers struggle to find a better K, no one has noted the strong likelihood that K is not the problem; rather the equation is wrong.

Our inability to measure longshore transport volumes meaningfully is a major problem with engineering design of beaches. There is a significant chance we really have little idea of the amount of sand transported annually in the surf zone of any given beach. As a result some impossible numbers have been calculated. The Army Corps' Wilmington, NC District have stated in public hearings that 2 million cubic yards of sand are transported to the south annually on Pea Island, NC; a huge volume. But this portion of the outer banks has a rocky shoreface and is clearly sand starved. Initial estimates of sand transport on Bogue Banks, NC were 10,000 cu yds annually (USACE, 1984). Recently, in order to justify a nourishment project the estimate has been recalculated to 1 million cu yds of sand per year. The larger sand volume allows the agency to blame its channel dredging program for the erosion problem and thereby get agency funding.

Sophisticated numerical mathematical models such as GENESIS (Hansen and Kraus, 1989) and SBEACH (Larson and Kraus, 1989) have been devised to predict beach behavior. Both of these recently devised models ignore well established principles of shoreline evolution, (Pilkey et al., 1993; Young et al., 1995), including:

The fact GENESIS ignores cross-shore sand transport. SBEACH ignores longshore transport;

- Shore perpendicular bottom currents, not of longshore current origin, are now believed responsible for large volume transport on some shorelines (Wright, 1995);

- Geology, i.e. the nature of the underlying shoreface, including rock outcrops, mud layers, unconsolidated sands and other sediment characteristics control long term shoreline behavior (Riggs et al., 1995); and

- Some models (e.g. GENESIS) do not consider the role of individual storms. Models that do consider them (e.g. SBEACH), simply change wave height and period of the presumed monochromatic waves striking the shoreline, which are certainly not the only variable generated among storms.

These omissions of important processes guarantee failure to predict shoreline change accurately.

The models are said to be "state-of-the-art" and they bear the stamp of approval of the government agency (the Army Corps) that is primarily responsible for beach erosion control. Versions of the models are available to consulting engineers, scientists, and non-technical citizens simply by sending in a self-addressed stamped envelope to the Corps. Placing these "user-friendly" programs in the hands of individuals who neither understand shoreline processes nor the weaknesses of all the assumptions behind the models, is most dangerous. Coastal managers in a number of states are now routinely handed "model runs" by consultants that purport to support a customer's requested variance from a coastal management regulation.

As an example, in 1997, a GENESIS model run predicted an eroding shoreline at Ocean Shores, Washington would stop retreating at a certain point. The town's coastal management plan is based on this prediction, but there is little understanding why the shoreline is eroding much less why it will suddenly stop eroding. The use of GENESIS has produced a nonsense answer, cloaked in numerical model sophistication, which bears the seeds of destruction of the community's beach.

Beach nourishment mathematical models are assumed to have general application. For example, a model suggesting use of the annual highest 12 hours for storm wave height (Houston, 1996) has been applied to beach change problems in New Zealand, Belgium and Florida; areas of greatly differing wave climates. Putting it another way, the simplifying assumption is that all beaches are the same, and that the annual 12 hour maximum wave height is representative of storms everywhere. This is nonsense, of course not scientifically defensible.

Discussion

Why is it not obvious when the models fail to predict longevity? First, success or failure is best judged on a five to ten year time frame. Secondly, proof of success is not always straightforward in the natural environment. For example, nourished beaches usually disappear at dramatically different rates along their length. More importantly, there has been no systematic effort to monitor nourished beaches in relation to model prediction. When the new beach rapidly disappears, a variety of excuses are offered by the model proponents. Never included is the statement that our predictive models didn't work. Instead, excuses include:

- The storm that damaged the beach was a most unusual and unexpected event, thus way the model could not have predicted its occurrence;
- It's true that the subaerial beach disappeared quickly, but the sand is just offshore "doing its thing"; and
- It's true the subaerial beach disappeared quickly but the beach and property loss would have been much greater in that last unusually severe storm if the nourished beach had not been there.

Even if a model prediction is correct, the model's validity is not necessarily demonstrated. All the major numerical models have numerical constants or "fudge factors" used to come up with "reasonable" numbers. The model GENESIS (Hansen, 1989, Young et al., 1995) has at least three of these including the aforementioned K factor for longshore transport volume estimates. There are regional differences in the durability of nourished beaches. If the "fudge factor" is adjusted on the basis of local experience with nourished beach dynamics model may appear to work, but such a success has nothing to do with the model design and assumptions.

Over the years I have observed a number of reactions by coastal engineers to criticisms of their beach behavior models. These include:

- The models we are using are the best we have and we should continue to use them until better ones come along;
- Congress has asked us to come up with numbers;
- We don't really take the models seriously, we are using the models to check results obtained by other means;
- We are learning from our mistakes; and
- Model opponents are neo-luddites.

All of the above statements are wrong. Wrong numbers are not better than no numbers. Just because we have no better models is not a reason for using poor models. Just because politicians insist on numbers is no reason to come up with flawed numbers. Komar (1998) even suggests that our widespread use of

numerical models to predict beach behavior is a reflection of coastal science maturity. Indeed, beach behavior models are so poorly founded as to indicate a state of coastal science immaturity.

Some of the reasons reliance on models will likely continue are:

- Models are believed to be state-of-the-art and the most sophisticated approach to beach design. The public and its politicians have been conditioned to believe that mathematics and sophistication are one and the same.

- A geologist or engineer approaching a city council using a qualitative approach (such as use of the behavioral history of adjacent nourished beaches) is a priori less impressive to politicians than a neatly presented complicated mathematical model.

- Geologists are a qualitative group practicing observational science (Baker, 1994). As a result, close examination of engineering models by them is generally lacking, and in fact, the models are generally accepted in the coastal geological community, albeit with a jaundiced eye.

- The technical background for coastal management in the US is carried out by two groups: scientists and engineers. Neither group understands well the modus operandi of the other. Communication on modeling is rare.

- The application of engineering models of surf zone processes needs much more scientific input. Principles that are clearly wrong and not scientifically defensible (e.g. the assumption of no cross shore bottom currents in the surf zone) must not be inserted into the models.

There are alternatives to the use of models in beach design (Pilkey et al. ,1994). Perhaps the best assumption is that the beach will behave like neighboring beaches. The Dutch design beaches by determining the behavior of the natural beach over a ten year period, and assume the nourished beach will do the same (Verhagen,1992). To assume success, they put in a 40% excess volume of sand. A third approach is to merely dump sand on the beach and run. This is done on many US beaches when navigation channel sand is used for nourishment.

Conclusions

There is yet no indication mathematical modeling is useful in engineering design of nourished beaches. Indeed there is every indication the models are inadequate for engineering purposes, and are promoting poor coastal management by providing a poor baseline for comparing management alternatives for retreating shorelines. There is some question whether mathematical modeling will ever produce useful numbers to describe earth surface processes in a fashion useful for engineering purposes. Society requires realistic predictions that are probabilistic along with estimates of required sand volumes plus 40%, and realisitic costs.

The mathematical models used for beach engineering need dissection by teams or panels of both engineers and scientists. Funding is needed to evaluate beach nourishment projects from the standpoint of model assumptions and predictions. Needed most of all is communication between field scientists and the coastal engineering modelers.

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IN THE FACE OF DISASTER—SCIENCE FOR PEOPLE AND NATURE

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Introduction

The settlement of Atlantic Canada was initiated and guided by the richness of the sea. Communities developed near those ocean resources that provided the needs of life and commerce. Groundfish species, such as cod, flounder, plaice, halibut, turbot and the like were the heart of this wildlife resource. For 500 years after European arrival the groundfish fishery dominated work and community life. Even in modern times, when revenues from groundfish comprised a relatively small percentage of provincial GNPs, the fishery was the lifeblood of many small coastal communities in Atlantic Canada and of most communities in Newfoundland. Historically annual harvests fluctuated but stocks were sustained. Records of saltfish exports from Newfoundland from l850 to l950 averaged 250,000 tons of cod annually (Harris l990).

By mid-twentieth century the character of fishing changed. New technology allowed inshore fishers to extend both range and effectiveness. Fishing could occur at great distances from home, in deeper water, and for a greater portion of the year. Offshore, international fleets came to the Grand Banks with deep-water trawlers further increasing fishing pressure. Fish were hunted and captured most everywhere, and at anytime. Sanctuaries, historically created and maintained by limitations of fishing technology, disappeared. The pace of technological innovation and fishing power quickened, fueled by profits and competition. Catches of Northern Cod climbed to over 810,000 tons in 1968. Landings then fell precipitously to previously unimagined low levels (FRCC l996a).

In l977 the Law of the Sea Convention enabled Canada to declare a 200 nm. economic zone in which fishing could be controlled. This provided a fresh opportunity to control foreign open access fishing, rationalize Canada's exploitation, and to rebuild fish stocks. Rebuilding strategies were formulated and implemented; restoration began. The Canadian fishing industry, encouraged by renewal of stocks and nationalization of the resource, grew to meet the challenge. During the l980's landings of groundfish began to increase. Fluctuations in catches were explained by variation in migrations or ocean climate. Unnoticed by scientists and managers was the remarkable growth in effort required by fixed gear, inshore fishers to maintain catch levels. Offshore deep water trawler skippers, who could hunt the ever-social cod to the last school, reported less noticeable declines in catches per effort, once fish concentrations were found (Steele *et al.* 1992).

The biomass of Northern Cod, which was once estimated to be 3-4 million tons, decreased dramatically. In spite of a large effort by the industry, catches in l99l declined to 60,000 tons. By l992 the status of the Northern Cod had declined so dramatically the Minister of Fisheries and Oceans (DFO) implemented a moratorium. Shortly thereafter scientists estimated the biomass at a few thousand tons. Additional closures followed in the next few months for many groundfish stocks on the recommendation of the Fisheries Resource Conservation Council (FRCC 1996a).

The resources, which historically sustained the communities of Atlantic Canada, had disappeared. The magnitude of the disaster could be seen in the faces of the 40,000 individuals displaced from work. The closed and empty stores within small communities reflected the loss. Rural communities are losing

people at an alarming rate. Churches, schools and other services in hundreds of communities are threatened. Communities, whose reason for existence vanished, now struggle to find a way to survive (NRTEE 1995).

Failures in Groundfish Science

Many factors contributed to the loss of the Atlantic groundfish: over-fishing, dumping and discarding of juvenile fish, destruction of spawning and juvenile habitat, adverse impacts of modern fishing gear, natural predation, ocean climate, foreign fishing, and poor conservation (FRCC 1996a). Over-fishing and over-capacity are seen as the major problems, but it is possible that many factors played some role. For our purposes here we will look at characteristics in the science which was provided that may have contributed to, or permitted the decline of Atlantic groundfish.

As groundfish resources slipped away, responsible scientists and managers remained alarmingly silent. How could the demise of such a critical resource for the most part escape the full attention and notice of science. Did they raise alarms? Examining the tragic decimation of Atlantic Canada's groundfish can perhaps identify pitfalls to avoid in the future. A number of characteristics of the science underpinning groundfish management weakened its effectiveness in preventing the tragedy.

Limited Information

First, knowledge by fishery scientists of the stocks studied was extremely incomplete. Data for many stocks was available for only a few years at best. Most scientific effort was focused on providing biomass estimates to guide exploitation. However, too little effort was directed at basic biological and ecological problems and in particular, how the ocean environment impacted fish abundance.

Further, fishery biologists responsible for advice on groundfish quotas were not teamed with those studying bait species, predators or physical oceanography. There was compartmentalization of the scientific effort rather than integration of biological and ecological information in the process of producing an estimate of groundfish abundance scientists did not integrate natural history, ecology, or biology; information that would prove critical to the status of the fish stocks (FRCC 1997).

Of particular concern was the lack of information scientists had on the fisher behaviour and how it impacted the fishery. Though management of fisheries primarily involves managing people and not fish, scientists had little systematic information on fishers responses to technology, stock conditions or regulations. For stocks where information about the fish came solely from the commercial fishery, this was a serious. The fact that fishers themselves were not studied meant that scientists were unaware of the dramatic increase in both fishing effort and fishing power being used by inshore fishers to maintain stable catches.

Elliot Norse (1993) noted vast ocean areas where little information is available on oceans, the inhabitants and the climate and ecosystem processes which support them. Fred Aldrich, giant squid biologist, often said we know more about the moon's backside than we do about the ocean's bottom.

Uncertainty of Information

Second, there was a failure to understand, or act upon the uncertainties of the stock assessment process. When the process produced a biomass estimate there was a tendency for it to take on an importance that went beyond the validity of the number itself (FRCC 1997). Estimates of fish biomass typically have serious limitations including adequate sample size. Thus the estimates have large uncertainties. This makes planning difficult and, when taken seriously, may open the door for politics of one kind or another to enter resource decisions.

Groundfish scientists were simply over-confident. They did not challenge and cross-check their estimates, and did not adequately communicate uncertainty in their data and analyses to decision-makers. Decision-makers acted as if scientists were providing solid, accurate information on stock status. This failure to

carefully consider the gaps and weakness of the process and advice lead to serious errors in the setting of quotas and management activities.

Linkage to Management

Third, science was not closely linked with management actions in the fishery. The fisheries are the major source of fish mortality beyond natural mortality. However, the effectiveness of regulations controlling fishing gear, fishing conditions, and practices that impacted fish stocks were not carefully monitored and systematically evaluated by science. For example, the fishing plan might require fish above a certain size to be landed. Fishers fished as before, but simply sorted and dumped the undersized fish prior to selling. Such practices were rarely measured and used in assessing stock status and establishing biomass estimates. The extent to which management actions lead to changes in fishing effort or practices were unquantified or unknown; undetected changes in fishing effectiveness lead to serious misinterpretations of catch- per-effort.

Trust

A final limitation in the science activity is concerned not with scientific substance or process, but the context in which the science occurred. As fisheries grew more specialized, and as scientific process became more technical, a distance developed and grew between scientists and fishers. Fishers with their practical knowledge of fish, and the factors that affected them, found themselves unable to talk to highly specialized modelers of virtual fish populations. Scientists, on the other hand, grew to regard fishers as biased observers and regarded their observations as suspect. Recently, after the release of a groundfish status report in Newfoundland, a fishermen's union official publicly requested that scientists get down on their knees and apologize for presenting such flawed assessments. As the worlds of fishers and scientist grew apart, mistrust set in and affected the process of setting quotas and the establishment of management practices. Concerns for a lack of transparency in the scientific process further fueled the isolation of both fishers and scientists. The isolation of science permitted politicians and the fishing industry to set quotas and establish practices which discounted the best scientific advice.

In conclusion, the limitations in the relationship of scientists to the fishery, in the substance of the science used, and in the process in which it was used, weakened the effectiveness of science to prevent the collapse of Atlantic groundfish stocks. In retrospect science might have better-served and have been better used. The FRCC, in its review of the Atlantic groundfish declines, said that "the first lesson learned was one of humility; humans simply cannot control nature in the manner assumed by standard fisheries models." (FRCC 1996a). The limits of the science process weakened efforts to sustainably exploit Atlantic groundfish resources and it eventually collapsed. The use of incomplete information with large margins of uncertainty for management actions that are not fully monitored and assessed, is a situation that many who work in managing coastal zones are familiar. The lessons learned should permit the use of a management process that recognizes that the impact of our actions cannot be accurately predicted. The precautionary approach should now be used, and has been adopted by the Department of Fisheries and Oceans Canada (DFO). To err on the side of caution gives one the opportunity to make smart mistakes.

Limitations in Science

Global concern over management of natural resources has increased as resource declines and conflicts over utilization are all to common. The role of science in formulating resource management policy, in decision-making and in monitoring impacts of exploitation are commonly discussed and a greater understanding of what science can provide has been achieved (Levin 1993). Science can be described in several ways. First, it is a body of information and principles that have been carefully tested and verified. It is also a process of inquiry, governed by simple rules by which information can be obtained. Some have become discouraged at what science can bring to management (Levin 1993). While there is general agreement that one should employ both scientific information and the scientific process, there remains

uncertainty, perhaps skepticism, as to how useful it really is. Several fundamental problems have been identified as limiting the contribution of science to planning and managing.

Timeliness

The speed with which scientists can provide advice on resource or ecological questions, compared to the urgency with which it is required by decision-makers is of concern. Assessing the effects of ocean climate change on fish recruitment or abundance will vary with the rate at which the processes occur, the natural variability within components, and the speed of the scientific process. Even fairly straightforward estimates of single-species abundance may take longer than the time at which decisions must be made. Given that DFO has adopted the precautionary approach, resource managers will hopefully be required to wait for solid advice

Simple Answers

The very nature of the scientific process often means scientists cannot always give an unequivocal single answer to a question. Debates about the relative contribution of fishing mortality, changes in ocean climate and predator abundance to declines in Atlantic groundfish stocks still take place (FRCC 1995). The process of evaluating hypotheses means that several alternative explanations are considered together. Mobilizing consensus behind a single explanation requires the elimination of alternatives by empirical testing. Decision-makers will often be provided with a range of scientific opinions about an issue; they must then choose between them, on some basis. Scientists can be extremely valuable in such a climate by providing expert opinion and evaluating the consequences of different choices.

Try it

Decisions must often be taken in such a climate where outcomes cannot be predicted with certainty. However the management initiative itself can be understood as the manipulation of a variable, an experiment, the effects of which are to be measured. Management actions are in fact large-scale experiments, properly designed evaluation of which can provide greater understanding of how things work (Walters 1986). Science can help in establishing programs by designing methodology for evaluating them.

It is most important to note that the best possible science is critical to the wise management of marine affairs. Science is required in making wise choices and planning. Understanding the nature and limitations of science is a prerequisite to its wise use.

Science Requirements

Science can contribute important information and fill an important role in the process of coastal zone management. Our concern in Newfoundland, and throughout much of Atlantic Canada, has been to develop an understanding of fish stocks such that a basis for sound exploitation can be established. For us, sustainable fisheries are the basis for sustainable communities (NRTEE 1995). To achieve the best possible science I believe we need to somewhat modify traditional science.

Study a System

Its appears clear scientific diversification effort is required; the study of human behaviour as it contributes to the exploitation of marine resources; and the ability to predict human reactions to conditions or regulations. Scientists from the disciplines of anthropology, sociology, political science, psychology and economics will play a significant role. It was not long ago that a DFO Science Branch official noted that they once had a social scientist but the person was converted to a statistician! Fishing must be studied as a harvesting system and systematic inclusion of information about both people and fish is necessary. If we indeed are managing people and not fish, then we should be studying people at least as much as fish.

Traditional Knowledge

With down-sizing of budgets it will even more difficult for conventional science to provide information on all the issues facing communities and fisheries managers. Dependence on traditional knowledge of resource must complement scientific work (Neiss 1995). Traditional ecological knowledge is valid and, when systematically gathered and summarized, may provide excellent guidance. It should be a comfort to scientists to tell them that such information undergoes rigorous peer review.

In some northern Canadian jurisdictions, gathering and consideration of traditional ecological knowledge is now routinely required to determine the need for, and the specific areas where standard scientific work may be required. Traditional knowledge is used as the foundation of science. Studies which have examined fishing behaviour and practices by Newfoundland fishers through systematic interviews are excellent examples of how important and useful systematic gathering of traditional knowledge can be (Neiss 1995).

Link Science to Management Action

A requirement of future science in the coastal zone will be its linkage to management actions, where these actions will be considered experiments (Walters 1986). Impact assessment of management regulations should be conducted prior to implementation. Recently the FRCC recommended impact assessments be conducted on all new fishing technology prior to its commercial use (FRCC 1996b). Monitoring and analyzing effects of management practices or innovations once implemented is also required. On the positive side, scientific sampling of fish catches in some Atlantic groundfisheries has been substantially increased to provide real-time information on effectiveness of harvesting regulations.

Participation/ Communication

Much scientific work requires specialization and attention to detail, that is best left to the scientist. But within the process of science there are opportunities for interested non-science stakeholders to contribute. Recently the FRCC developed a lobster conservation strategy after conducting discussions with the industry. Fishers and processors who participated identified priorities for research. DFO's Science Branch personnel enhanced fisher involvement in their research programs. Furthermore, experiments were designed in such a manner that commercial fishing activities could be used as part of the experimental design.

Throughout Atlantic Canada, DFO implemented a Sentinel Fisheries program which uses selected and trained fishers and their commercial gear to monitor fish stocks. Fishers are impressed with the data and have a widespread feeling the Sentinel Fishery data are their data. A bonus has been that, sentinel fishers have become supporters of the science program and effective teachers of their colleagues. DFO scientists have now invited fishers in phases of their scientific work including sailing on research vessel cruises and participating in stock status discussions. Reactions to these interactions vary, but are generally thought favorable by both fishers and scientists.

The scientific process requires study results be communicated so that they may be scrutinized and possibly used. The role of scientist as a communicator and teacher outside the scientific community has not been systematically incorporated into management activities. To ensure that scientific information is distributed effectively, and interpreted correctly, its scientists must be active teachers. Planners and users of information should ensure they create and incorporate such opportunities into their schedules of work.

We have learned to be smarter consumers of scientific information, wiser in incorporating the process of science into management, and better users of scientists themselves. One good example of smarter use of science can be found in the Marine Conservation Area Feasibility Study on the NE Coast of Newfoundland.

A Marine Conservation Area

Heritage Canada developed a Marine Conservation Area (MCA) policy several years ago as a means of extending its conservation mandate into the marine environment. Legislation is before Parliament in support of this policy. Similarly the Department of Fisheries and Oceans under *the Oceans Act* has developed a Marine Protected Areas (MPA) policy (DFO 1996). It should be noted that this same Act gives DFO the federal lead in bringing planning to Canada's marine environment, thus implementing MCAs and MPAs offer an opportunity for a fresh approach to ocean studies.

Heritage Canada has proceeded with a feasibility study for the first MCA, which will be along the NE coast of Newfoundland and will include about 3,000 km of coastline and some 130 communities. Science involvement will give insights into how science will be used in coastal zone planning. The boundaries of the area for the feasibility study were developed following consultation with a large number of scientists, government departments, and community leaders. The area is, however, a good example of how communities, both human and marine, that occupy this part of Newfoundland, are seriously impacted by the recent groundfish closures over the last several years. The study is directed by a steering committee composed of people from affected communities and representatives of government. Field work is conducted by community facilitators who meet with groups throughout the study area; issues and concerns have been identified and prioritized. It has been decided that local people be informed, consulted, and empowered to control government agencies. A governance mechanism is being developed.

In addition, it was urged that sustainable conservation of marine resources be achieved to support local communities. Scientific work within the feasibility study area will be directed here. Scientific work includes consultation and education, surveys of traditional ecological knowledge, intensive evaluation of conservation objectives, a program to integrate scientific work, and evaluation of management initiatives.

Consultation/education

Our conservation issue within the feasibility study area involves declining catches of lobster and lumpfish, accurate measures of fish abundance, and conservation options for species like codfish. Heritage Canada has assigned a biologist whose prime job is to act as liaison between local people and scientists. When specific conservation questions or ideas are identified, the science coordinator brings them to meetings attended by scientists from government or the university. They review cod and lobster biology, help evaluate possible community actions, and develop plans.

Initially some scientists object to this role but eventually excelled. Integration of scientific work and its communication takes place at the Marine Interpretation Centre in Terra Nova National Park. Here a large laboratory allows scientists to conduct their work in full view of visitors; scientific interpretation is done at the same time. The goals are to involve scientists with communities and groups planning conservation actions, and to foster participation of local individuals and groups in scientific activities.

Traditional Ecological Knowledge (TEK)

There have been a number of TEK studies in the feasibility study area. They were begun about 10 years ago when peer-selected fishers were interviewed to determine species and areas of abundance, later reviewed by DFO and university scientists. These studies were used in the initial MCA boundary discussions. Biologists from Parks Canada later extended these interview studies to determine areas where juvenile cod were abundant (Potter 1996).

On Fogo Island, individual fishers plotted lobsters and flounder grounds, and rockweed beds used for herring spawning. These were integrated into a series of maps that depicted distribution of all commercially important species in the area, along with habitat characteristics for each species. The study by DFO and Fogo Island Fish Co-op represented the most comprehensive and detailed study of habitat anywhere in Newfoundland. Funding has been obtained so that similar studies can be conducted throughout the

entire feasibility study area. When completed the result will provide the basis for including habitat considerations in conservation and management actions taken in the MCA.

Participatory Research

An annual beach seine survey, the Flemming Survey, was advanced to access the abundance of inshore juvenile fish. Memorial University of Newfoundland and DFO jointly sponsored the survey in cooperation with local groups through a traveling scientist program. Fishers, using their own boats, high school science classes, and other interested individuals assist with the actual deployment and hauling of the net, as well as sorting of the catch. Close supervision by the scientist involved is necessary to ensure exact implementation of survey protocols. Scientists analyze and interpret the data and report to the communities.

A similar community program of integrated science has been developed to assess the extent and pattern of beach-cast, oiled seabirds. Locals survey beaches using specific methodology. A scientific and management committee composed of agency members systematically coordinates results.

It is hoped other community-based science studies will begin within the MCA. These may include surveys of ecologically sensitive habitats or sightings of marine mammals. Realization of such programs will depend on local interest, as well as availability of scientific personnel. Interested scientists, in cooperation with the fishermens' union, are presently designing a sampling program for the commercial fishery that will be in place in 1999.

Intensive Study

Consultations suggest specific concerns with the feasibility study area regarding conservation of lumpfish, lobsters, capelin and codfish. Scientists with interests in these species are encouraged to become involved with the MCA process and to focus their work here. Area scientists may be given contracts with Parks Canada, given housing, or access to park facilities. The program has been most successful.

Perhaps the most interesting work focuses on juvenile cod habitat requirements. Beginning with traditional ecological knowledge, juvenile areas were identified (Potter 1996). DFO Scientists, using sophisticated hydroacoustics techniques, characterize the habitat (Anderson and Dally 1996). University scientists are developing abundance surveys for these areas. The work will provide the basis for protecting this key life history phase and its habitat.

Integration of Scientific Work

Fishery scientists are often criticized for narrowly considering the ocean only one species at a time. While a more comprehensive look into the ecosystem is desirable the truth is that multi-species models linking ocean physics to the food web are most difficult. MCAs and MPAs offer the opportunity to begin to develop comprehensive models of ocean processes.

Within the MCA feasibility study area a plan to develop a minimally realistic ecosystem model has been formulated (Lawson 1998). The plan proposes to collect stomach samples from a wide variety of species, from whales to bait fish, throughout the area for an entire year—The Year of the Stomach. The goal is to develop a comprehensive idea of how organisms relate to each other as predator and prey.

A group of scientists have been informally advising staff involved in the feasibility study. It is hoped that these scientists will grow into a role of coordinating scientific efforts to secure information needed by individuals, communities and groups in the area.

Adaptive Management

An important role for scientists in the MCA study is their participation in the development, planning, establishment, and evaluation of innovative management techniques. At this point it is not clear what is required to achieve conservation of marine resources. Establishment of MCAs and MPAs will be a learning process; science will play a most important role in facilitating the process.

Within the MCA feasibility study area management innovation will be advanced by communities, fishing fleet representatives, or by committees representing particular user interests. Scientists will be involved in exploring options and offering advice during meetings with the interested groups. As plans advance, responsible management officials will become involved. Most important, the scientist will be responsible for developing a program to monitor and evaluate the effects of innovation. A good example of this has been the work of the Eastport Peninsula Lobster Fishermen's Committee.

In response to falling lobster catches the committee was formed to develop a plan in an attempt to halt the decline. Initially the group identified fishing malpractices, such as use of excessive numbers of traps and the keeping of undersized lobster. Fisher groups visited offenders pointing out their illegal activities. Such confrontations were very effective.

To increase lobster numbers, egg production must be maximized (FRCC 1995). Egg bearing female lobsters are easily recognized and when captured, must be returned to the sea. Females spawn every other year and on each subsequent spawning the number of eggs produced increases markedly. By identifying spawn bearing lobsters with a V-notch, they can then be identified the subsequent year and released. The committee decided to promote V-notching. To date, thousands of females have been identified and released.

Large lobsters could also be protected by simply not fishing them in specific areas (FRCC 1995). Thus, the Eastport Committee decided to restrict all lobster fishing in two small areas—their best lobster fishing areas. Scientists were recruited to monitor and evaluate this program. The local high school science class assisted by computerizing some of the data. Graduate students at the university became involved to conduct their thesis research evaluating different aspects of the project.

This particular conservation program will be a model for many more similar exercises within the MCA feasibility study area. Similar lobster programs are being developed in two additional areas and other areas have been proposed to protect lumpfish and shellfish. It is possible that some management innovations, such as particular test fisheries or conservation harvesting plans, could involve the entire MCA area. The strategy for these will be similar; local participation and direction, with science assisting with advice, planning, monitoring and evaluating.

The planning and establishment of MCAs and MPAs throughout Canada will provide exciting opportunities and challenges to develop new methods of working together, new relations between stakeholders and responsible agencies, and innovations in managing oceans and the coastal zone.

Science—A Users Guide

Users of science must be aware of the limits of scientific knowledge. While science can be useful to managers and planners as a valid and tested source of knowledge, there is much that is not known. When science applies its knowledge and methods to provide specific scientific advice, limitations in this advice must be emphasized. Uncertainties should be highlighed and considered in development of management plans; a precautionary approach is necessary. Scientific advice throughout the planning and management activities can assist in assembling information and interpreting it, and in planning evaluations of management actions. Science is a way of knowing and a tool for gaining information.

After years of struggling to understand the groundfish collapse, and attempting to establish practices that would prevent reoccurrences, the FRCC identified the key requirement for strong science in support of sustainable fisheries. They directed scientists to "work in partnership with the fishing industry to develop new and innovative science programs which make the best use of the abilities and resources of both. Communication between stakeholders and scientists is the primary responsibility" (FRCC 1997).

Restoring working partnerships, developing common goals, earning trust, sharing strengths are the fundamental requirements for effective incorporation of science and scientists into coastal zone management.

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EMPOWERING COASTAL COMMUNITIES: MORE PARALYSIS BY ANALYSIS?

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Introduction

This paper is a synthesis of what I have learned and what I believe are key considerations when discussing empowerment of coastal communities. During 14 years in the field of participatory processes, I have worked with local provincial, federal levels of government, for a national research institute, and am now self-employed. Much of my experience has been in projects involving coastal communities. The observations and comments contained herein, are therefore based on practice and not from theoretical models.

The term "communities" in this paper refers to any group of people (stakeholders) who have an interest in, affect or are affected by, a decision or action (this could be a policy, a plan, or a development project, etc.). This is a similar definition to that put forward by the Niagara Institute in 1989 when the Institute coined the term "stakeholder[1]."

Empowering coastal communities begins with organisations (an organisation is any agency, organisation, or institution) recognising that they too are communities and hence need to be empowered. Once internal empowerment has been achieved, there then exists the opportunity for empowered relationships with coastal communities and organisations.

Empowerment: what does it mean anyway?

There are definitions of empowerment, and these are found throughout the literature on community development; governance; team building; new-age management, etc. Communities define empowerment in several ways:

- early involvement in any decision-making process;
- the opportunity to discuss ideas openly and without prejudice;
- involvement in a decision-making process;
- having the resources and capacity to participate fully and effectively;
- being listened to;
- being part of determining the future;
- sharing responsibility;
- having access to relevant and timely information;
- having your knowledge value respected; and
- making decisions normally made by government.

Empowerment of communities is not necessarily having "power"; rather it is part of a continuum of building both trust and working relationships that lead to power in the form of influence over decisions being made. Despite rhetoric to the contrary, communities would rather be closer to, and more involved with, their different levels of government than doing away with them all together. There is an emerging desire to create partnerships with organisations where decision-making and responsibility are shared in an environment of respect and trust. Thus organisations become part of the community, a stakeholder in the empowerment process.

The Oxford Dictionary defines empowerment as "to invest legally or formally with power; to authorise, licence", and "to impact power, to enable[2]." Other definitions include "exercising choice, and being heard and seen" and "productive conversations[3]"; "passing on authority and responsibility" and "responsibility and self-directions[4]"; and "devolving not just tasks but decision-making and full responsibility too[5]." It seems that empowerment is a term that many understand intuitively yet it defies precise definition, with a range of acceptable meanings.

Attempting to define empowerment, of course, requires an understanding of "power." The Oxford Dictionary defines this in several ways including; 1) "the ability to do something or anything, or to act upon a person or thing; 2) ability to act or affect something strongly; 3) capacity of producing some effect; 4) possession of control or command over others; 5) dominion; 6) government." In my experience, those inside organisations tend to focus on 4, 5, and 6, while communities are more concerned with 1, 2, and 3. This difference in focus therefore may prove problematic when attempting to "empower communities."

Steward[6] discusses three types of power and their relationship to empowerment:

- *Role Power*: command and control type, where position in the hierarchy determines the power of the position holder;
- *Expert Power*: based on possessing knowledge or particular skills; and
- *Resource Power*: stems from the ability to supply or withhold resources.

Empowering, therefore means, recognising that these types of power exist and then developing a balance over how, and by whom, power is exercised: it is not simply abdicating responsibility. If we can agree empowerment means creating an environment of trust and respect where decision-making and responsibility are shared, then we can move to the process of achieving empowerment.

Creating the Environment for Empowerment

Organisations seeking to empower coastal communities must first empower their staff. Senge[7] states that "many executives are articulating a new philosophy of empowering people" but that "few organisations are working hard to introduce tools and methods" to ensure empowerment happens and is maintained. Stewart[8] states that empowering people is "essentially a matter of cultural change." She goes on to assert that the change should be organisation wide, with substantial shifts in attitudes and beliefs required to affect that change. So what does this mean for organisations that wish to empower coastal communities?

Changing the Culture

In order to change an organisation's culture, one needs to understand its culture. Does the organisation revolve around one highly charismatic character that provides ideas, direction, and decisions (e.g. Richard Brandon, Virgin Airlines)? Does the organisation have a hierarchical, pyramidal management structure with many formal, and often suffocating, procedures (e.g. most bureaucracies)? Perhaps the organisation bases itself on task achievement, where managing and process are often overlooked (e.g. New Zealand Crown Research Institute).

An empowered organisation is often described as having " inverted the pyramid"[9] so the staff appear on the top, with the manager (or team leader) appearing on the bottom. This inversion is intended to symbolise the notion that the manager is there to support and encourage staff, not to sit above and be somehow superior to staff. What this means is a shift from the command-and-control model where the manager dictates, to one where assumptions are challenged and staff skills and competencies are more fully utilised. The challenge of prevailing assumptions, such as the role of managers, is summed up by de Bono[10] thus: "It is historical continuity that maintains most assumptions—not a repeated assessment of their validity." So where does this take us?

The 6 C's

There are six critical points that need to be worked through by an organisation before it attempts to empower coastal communities. The six points are; cultural change; commitment; capacity; co-ordination; community; and communication.

1. Cultural Change

This is the proverbial paradigm shift—the move from "talking the talk to walking the walk." The staff of an empowered organisation works in a climate of trust and openness, where there are commonly held values, and where old assumptions are routinely assessed for their relevance.

Trust is perhaps one of the most important factors for empowerment. Managers can begin to build trust by accepting that errors or failures may happen in the pursuit of goals and that these should be regarded as learning experiences. There needs to be a degree of trust in those staff that are prepared to take risks to achieve goals, and staff need to know that managers can be trusted to support them where necessary.

Openness requires freedom to express doubts or criticisms without fear; it also means ensuring that everyone has access to information and ideas, without feeling that "things" are being kept from them. An empowered organisation would also engage in two-way appraisals, i.e. managers appraising staff, staff appraising managers.

Commonly held values between management and staff are critical. Part of this is sharing and believing in the vision and/or mission of the organisation. Too often have I come across staff who feel totally marginalised from the vision either because they don't know what it means and how it should affect their performance, or because they have watched the process of developing a vision in a vacuum, i.e., they were not part of the process. Core values are often expressed as part of, or alongside, the vision. Again, if the staff does not feel particularly moved by these, they are less likely to promote them or use them in their work.

A cultural change, therefore, requires that staff are kept actively involved in the processes that drive and define the organisation.

2. Commitment

Often nowadays one of the core values expressed by an organisation is its intention to consult with the community. However, this is not always defined in such a way that staff or the community knows what to expect, or what is expected of them. A first step in demonstrating commitment to involvement of community in a meaningful way is to develop a set of *principles and guidelines* that state clearly and without ambiguity what consultation means to the organisation. The document should outline the types of situations where the organisation will involve the community, and suggest the extent to which the consultation will take place. There is a continuum of involvement from merely providing information, all the way through to the devolution of decision-making.

The empowered organisation strong supports the *new professionalism* that is required to involve the community successfully. Skills might need to be honed or learned, and consideration given to identifying a core group of skilled individuals within the organisation whom can be called upon to facilitate involvement in the process.

A further component of commitment is the extent to which individuals within the organisation believe that involving communities actually *adds value* to the process of decision-making. If the organisation and/or the individuals are working with the community merely to fulfil statutory obligations, then commitment is unlikely to be strong. This usually leads to unsatisfactory processes, confrontations, and a retreat to the old assumption that communities can't be worked with successfully!

3. Capacity

This point is important since in my experience, while organisations may have all the glossies and the talk about community involvement, they often do not have the capacity to deliver. Capacity covers more than numbers. It includes resources (time, money, information); a well-skilled staff; and an understanding of participatory decision-making.

Working with communities requires *resources*. In the early stages of working with communities, the person (usually from the organisation) who begins the process needs flexibility. It is easy to schedule a series of meetings, events, or actions that, in the office and on paper, seem to achieve the purpose. However, communities usually work to a different schedule, usually participating outside their working day. This means allowing the time for participants to meet when appropriate for them; time to read and absorb any information that may be presented; and time to carry through any tasks or actions agreed upon. Money as a resource is often not the critical issue for communities directly. However, there is a need for the logistics-of-involvement to be adequately covered, and that seed money be available to kick-start agreed actions.

Information flow is crucial. Communities often perceive that information is being withheld by organisations. It is vital, therefore, that information is timely, relevant, and freely available. If information is not readily available, steps should be taken to acquire it, or to discuss why it is not available and perhaps find an alternative.

The skills required of staff who are to engage in communities are many and varied. For a manager it is about skills needed to support the staff who will actually work with the communities. These skills[11] can be described as:

- **Enabling**: providing financial and other resources required. It also requires ensuring staff have the self-confidence and knowledge they need to be effective;
- **Facilitating**: the removal of undue barriers or constraints that stop staff from reaching their potential. Barriers to creativity and innovation also need to be broken to allow staff freedom to consider and test new ideas, and to assess old assumptions;
- **Consulting**: staff have knowledge from the "coalface" that should be acknowledged and incorporated into day-to-day matters and also strategic issues; and
- **Mentoring**: empowered management is about sharing decision-making and allowing others to carry out tasks that may previously have been the manager's responsibility. However, in passing on these responsibilities the manager may not have the opportunity to exercise skills she/he has. Thus mentoring ensures these skills are passed on, used, and not lost. Coaching is also part of mentoring, and involves working interactively with staff to increase their knowledge and confidence.

The skills required at the staff level are similar to above, but in a different context. That is, they will not only be required to develop and use these skills within the organisation, but also with communities as part of the empowerment process. In addition, it is important that:

- staff are committed to, and *genuinely interested* in the involvement process;
- staff understand the *nature and stages of group development*[12]. Groups do not usually come together and become a unified and workable entity at first meeting. There are many stages of group development and these are often not understood. Of importance is to recognise that groups will go through a period where they are frustrated, angry, confrontational, and questioning of each other, and particularly of any organisation. This is often referred to as the "storming" stage. The following diagram calls this stage the "groan zone"[13] —the point where all views are on the table and everyone is arguing for their own position (Figure 1). This is rarely comfortable for the staff from organisations and is most often the point where the process breaks down. Old assumptions rear again—"I told you we would never get anywhere with that community." However, with the right skills and understanding of what is going on, the groan zone can be worked through and decisions arrived at; and

- individuals working with communities need to be extremely flexible and comfortable with challenges to prevailing assumptions. Communities will question, prod, and expect to provide input to whatever you may have considered an appropriate process. They may also want to redefine the purpose of the process, have other things considered besides the information presented (e.g. traditional and local knowledge).

Figure 1. The groan zone of the empowerment process.

A further component to capacity is an understanding of participatory decision-making, what it is, and how it works. Participatory decision-making is based on principles such as:

- **Inclusiveness**: actively encouraging participation;
- **Respect for diversity**: all views are equally respected and encouraged;
- **Promotes inclusive solutions**: as the Quakers say, "everyone has a piece of the truth." Inclusive solutions are those that everyone has had a hand in developing and can live with; and
- **Engender-shared responsibility**: a cornerstone of empowerment.

Participatory decision making differs from conventional decision-making in several ways. The following table[14] lists these.

4. Co-ordination

A common complaint from communities is that the "left hand never knows what the right hand is doing." By this they mean that individuals from the same organisation often contradict one another; that organisations who should be working collaboratively often do not; and that a lot of energy is wasted when projects are duplicated and not co-ordinated.

For co-ordination, the notion of *"turf" needs to be challenged.* Communities are not necessarily interested in mandates or old disputes over where individual organisation's territories lie. They are more interested in having the right people at the table, with the resources and information necessary to achieve the goal or purpose.

PARTICIPATORY GROUPS	CONVENTIONAL GROUPS
Everyone participates, not just the vocal few	The fastest and the loudest get more air time
People give each other room to think and get their thoughts expressed fully	People interrupt on a regular basis
Opposing views are allowed to co-exist	Differences are treated as conflicts that must be stifled or solved
People draw each other out with supportive questions	Questions are perceived and delivered as challenges
Each member makes the effort to pay attention to the person speaking	Unless the speaker is captivating, people space out, doodle, check the clock, yawn
People are able to listen to each other's ideas, and know their ideas will also be heard	People have difficulty listening because they are too busy rehearsing what they want to say, usually in judgement
Each member speaks up on controversial matters, and everyone knows where everyone stands	Some members remain silent and no one really knows where everyone stands
Members can accurately represent each other's points of view—even when they don't agree with them.	Individuals rarely give accurate representation of views that do not coincide with their own
People don't talk behind each other's backs	People talk and scheme behind each other's back
People are encouraged to stand up for their values and beliefs	People with minority perspectives are discouraged from speaking out
Problems are not considered solved until everyone understands the reasoning	Problems are considered solved as soon as the fastest and the loudest pronouce them so, others are expected to "come on board" regardless of understanding
Agreement reflects a wide range of perspectives	Agreement assumes all are thinking the exact same thing

It follows, therefore, that an empowered organisation that has staff buy-in and support the vision (and all that this means for the *modus operandi*) will not be sending contradictory messages. That in the spirit of throwing out old assumptions (because they no longer apply) the best person for the job will be sent out regardless of perceptions of territory; and that because there is effective communication, duplication of effort will be avoided.

5. Community

I consider it important that the organisation consider *what is "community."* In the case of coastal communities does it mean the entire population of the coast? Or is it a geographically bounded area or an ecosystem? Or is it a group of key stakeholders who hopefully represent the interests of the general public? Does the organisation consider itself a community, and also a part of the external community?

When considering *the need* to involve communities (however defined) it is helpful to consider if, in meeting your needs, other needs can also be met (the community may have things it would like to achieve for example). While an organisation may believe it has expressed its need well, the community often doesn't yet see or understand the need. "Finding the button", that will encourage participation, *is key.* It is also important to specify the *types of outcomes* the organisation is seeking. Is it a management plan? Is it an action plan? Is it considered input into policy? Once the community agrees with your need, or can see a way of meeting its own needs through a process, the how-to can be designed. This is where flexibility is once more required as the community may come up with ideas of their own as to how best achieving the outcomes. Considering that the community participants are likely to be "volunteers" it behoves the organisation to accommodate these ideas or they may find themselves without a community!

6. Communication

It is almost a truism now to say that communication is vital. Yet too often communication is seen as brochures, handouts, newspaper advertisements, and websites. Engaging in constructive dialogue requires face-to-face interaction. Participants need to see and feel that they are being listened to and need opportunities to listen to a wide range of views.

Listening is a vital part of communication and one of the hardest things to do well. Encouraging and promoting active listening as part of the culture change in an organisation helps not only internal communication but also communication with those from the outside.

Communication must be *timely.* Given at the appropriate point in the process, and with time for absorption. It should relevant, providing added-value to the process, and inform the participants. And it should be at the appropriate level. Technical and scientific papers may need to be summarised.

Individuals should be encouraged to be *clear and honest*—if the answer is not known, don't waffle, admit to not knowing! Communities like and respect honesty—admitting to not knowing shows you are human and not just part of the machinery of an organisation.

And last but not least—celebrate successes, even if they are small. This is important for maintaining moral and motivation both for staff, and for the community involved.

In conclusion, it should be noted that this paper could have been addressed, substantially unchanged, to the empowerment of coastal communities. All that have been identified as being of importance to creating an empowered organisation are of equal value when empowering communities. It is like a circle—an empowered organisation leads to empowered staff, who lead to empowered communities, that lead back to empowered organisations who are in-and-of-themselves communities. Although one can enter the circle at any point, it makes sense for an organisation to begin with the empowered organisation and work around the circle, enabling it to promote and engender empowerment of coastal communities.

The statement "***paralysis by analysis***" in the title of this paper refers to the tendency of organisations to seek absolutes before taking action. This could be absolute scientific proof, absolute certainty of outcomes, or absolute control of the process. Seeking to define what empowers a coastal community, therefore, could prove fertile ground for analysis for many years to come without actually empowering a coastal community. As we are all aware, empowerment is one of the buzzwords of the moment and if we seek to define it absolutely, its moment in time will be lost as we latch onto the next buzzword.

I have presented what I consider to be the essence of empowering coastal communities, that is, organisations need to be empowered and view themselves as communities. By learning how to work amongst and between organisations, the capacity will be built to work with coastal communities who are ready and willing to work in genuine partnership based on trust, honesty, and shared responsibility for decision-making and implementation.

And if you really want to know how to empower coastal communities, go ask them!

Endnotes

[1] The Niagara Institute, 1989. *Public Participation Handbook.*

[2] *The Shorter Oxford English Dictionary*, 1973. Oxford University Press.

[3] Peter Senge, 1996. *The Fifth Discipline Fieldbook.* Nicholas Brealey Publishing.

[4] Richard S. Wellins et al., 1991. *Empowered Teams*; Jossey-Bass Inc. Publishers.

[5] Aileen M. Stewart, 1994. *Empowering People*; Pitman Publishing.

[6] As above.

[7] See endnote 3.

[8] See endnote 5.

[9] Stewart, as above, and Allen Mackay, 1993. *Team up for Excellence.* Oxford University Press, Craig R. Hickman et al., 1989. *Creating Excellence; managing corporate culture.* Unwin Hyman Ltd.

[10] Edward de Bono, 1988. *Lateral Thinking.* Penguin Books.

[11] Adapted from Stewart, as above.

[12] A good source for this is: Jarlath F. Benson, 1993. *Working More Effectively with Groups.* Routledge.

[13] Adapted from: Sam Kaner et al., 1996. *Facilitator's Guide to Participatory Decision-making.* New Society Publishers.

[14] Kaner's book is highly recommended as a "how-to" reference for facilitators.

[15] Adapted from Kaner.

PIECES OF THE PUZZLE: SOLUTIONS FOR COMMUNITY-BASED FISHERIES MANAGEMENT FROM NATIVE CANADIANS, JAPANESE COOPERATIVES, AND COMMON PROPERTY RESEARCHERS

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I. Introduction
II. Design Principles for Community-Based Management
III. Community-Based Fisheries Management in Canada
A. Aboriginal Fisheries in Canada
1. Coastal Canada: An Overview
2. Aboriginal Fisheries Management in British Columbia
a. The Nisga'a and Gitksan Resource Management Systems
b. The Kwakiutl Resource Management System
c. Differences between Aboriginal and Present-day Management
B. Modern Fisheries in Canada
1. Fisheries Management in British Columbia after Western Settlement
2. Recent Developments in Modern Fisheries Management Systems
IV. Community-Based Fisheries Management in Japan
A. Historical Community-Based Management in Japan's Inshore
B. Modern Fishing Rights and Fisheries Management in Japan's Inshore
V. Conclusion

I. Introduction

The words *community-based management* and *co-management* are on many people's lips these days throughout Canada and elsewhere. They appear frequently in newspaper announcements and in government reports.[1] At the same time the public hears, much too frequently, about problems with natural resources. Fisheries are closed due to declines in fish stocks. There are doubts about the sustainability of timber harvests. Sections of coast are closed to shellfish harvesting due to contamination.[2] The recurrent mention of difficulties with natural resources convinced many people that there are chronic problems with resources that were long thought to be perpetually renewable.[3] Community-based management and co-management are touted by some as solutions to these chronic problems.[4] Others haul out the analogy of the fox guarding the hen house to counter the notion of the ability of communities of users to successfully control their rapacious self-interest.

Community-based resource management is a major departure from the way fish, forests, and wildlife have been managed in North America during the twentieth century. The standard form of management focuses on controlling users from over-harvesting the resources. This style, characterized as *top-down*, relies on the authority of government to enforce harvesting plans. The harvesting plans, in turn, rely on the analysis of technical experts. The technical experts conduct studies to determine the surplus that can be cropped without reducing the productivity of the given resource, be it trees in a forest tenure area, a

salmon stock, or a moose population. Once these plans are implemented, government employees have the task of monitoring and enforcing compliance with the harvesting plan.

A key premise of *top-down* management is that resource users are unable to self-regulate. Consequently, a crew of professional compliance officers is needed for enforcement. A significant part of government's interest in community-based management comes from an appreciation of the scale of costs for enforcement if the *top-down* model were to be truly effective. The cost required to ensure effective patrolling of national, provincial, or state coasts and forests is far beyond the scope of management budgets of contemporary governments—hence, the interest of governments in examining the option of community-based management.[5]

The notion that users of common property resources cannot self-regulate was the conclusion drawn in one the most influential resource management articles ever written. Garrett Hardin's title, *The Tragedy of the Commons,* entered the popular vocabulary as an indictment for the possibility of self-regulation.[6] Simply stated, Hardin showed mathematically that users who cheated by taking more than an equitable share of a common property resource came out ahead of people who acted cooperatively.[7] Competition among the users to take as much of the resource as possible before it is gone leads to the decimation of the resource. The paper suggested that solutions to this problem require either the intervention of external figures, such as the state, or the transformation of the commons into private property.[8]

Hardin's *Tragedy of the Commons* and the fox guarding the hen house analogy, which has become the popular reminder of the *Tragedy,* are important starting points for considering community-based management. There are many disbelievers about the possibility of communities successfully managing their own common property resources. Among these doubters are influential people, including scientists, civil servants, and politicians. There are also many disbelievers within the community of resource users itself.[9]

Others, however, are more optimistic. Much of the optimism comes from developments in an exciting new field of scientific research. The seventh meeting of the International Society for the Study of Common Property (IASCP)[10] took place in June 1998 in Vancouver, British Columbia, Canada. Hundreds of people from around the world who study and analyze community-based management of common property resources—fish, wildlife, forests, pasture lands, irrigation systems, and so on—attended.[11] The common property research field is broadly inter-disciplinary. It concentrates on the relationships among the actors within resource management systems, including the resources, the users, the state's regulators, and the resource management institutions. The research effort is directed toward understanding the conditions that lead to success or failure when the people who depend on natural resources manage them.

This community of researchers largely took Hardin's paper as a point of departure.[12] For many of them, Hardin's predictions did not match their research results. Consequently, a central question emerged: if Hardin's predictions were not universal, what were the characteristics of common property resource regimes that did not devastate the resource? The research took two main directions: case studies of communities involved in managing common property resources and the development of theory to identify the conditions leading to success in this form of resource management. The case studies now number in the thousands.[13] The development of theory has been slower, but there are now very useful insights.[14]

The timely development of these understandings is the basis for some optimism, even in the face of such dramatic resource failures as the ground fish closures on Canada's Atlantic Coast and successive years of poor salmon returns in the Pacific. In some cases recovery will be necessary before any form of full-scale resource harvesting can resume. However, whether for healthy or recovering resources, there is now a larger resource management tool bag from which to choose. The development of these understandings is even more timely for Canadian fisheries, given the need for change following a succession of Canadian Supreme Court decisions concerning aboriginal fishing rights.[15]

This article sets forth several solutions as pieces in a complicated puzzle. Significant changes are required within many nations' fisheries. Problems abound and there are few success stories. Canadian fisheries share these difficulties, and, in addition, the Canadian Court's recognition of aboriginal rights has shifted the allocation of priorities within many of the fisheries. Many of the changes are necessary to address conservation needs and to redress social injustices.

The community-based approach to fisheries management is one important direction for progress. Community-based management, however, is not a solution without problems of its own. It does not provide an off-the-shelf answer to resource management problems. Yet, there are potential benefits to both the resource and the human community. Community-based solutions do not come from citizens' groups, government agencies, or academics alone; rather, solutions come from all of these participants. Ideas, designs, and commitments on paper are not enough. Successful community-based management needs all of these, but it also needs the efforts of participants continuing to work out the inevitable conflicts. Above all, community-based management requires participants to change deeply ingrained habits, particularly from competition to cooperation concerning the resource. Committed people are the most fragile resource in community-based management. Fortunately, much more is now known about the conditions that lead to success in communities managing their own resources. This form of resource management is nothing new; rather, it has had a long course in human history. This article looks at three important pieces in this puzzle.

The first Part looks at the conditions for successful, long-enduring community-based resource management regimes. This is a critical piece of the puzzle. The design principles point backwards as well as forward in time. They provide a basis for understanding why management systems succeed or fail and also supply directions for designing institutions capable of successfully managing resources. At the same time, the principles provide an analytical foundation for understanding the success of the next two pieces of the puzzle.

The second Part takes a broad historical look at fisheries management in coastal British Columbia (B.C.), Canada. B.C., in particular, provides a very useful case study for examining changes within fisheries and the opportunities for community-based management. As mentioned above, change in Canada needs to occur in the context of fisheries failures and in the context of legal revisions of aboriginal fishing rights.[16] This Part focuses on the form that fisheries management took in aboriginal society and on the subsequent structures developed by government agencies. It also looks at the historical trend within B.C. towards private property rights as a method of resource management and examines the recent trends in fisheries along this direction.

British Columbia provides an important vignette of change and modernization in fisheries. Non-native settlement is relatively recent, dating from the late-1800s. Industrial-scale commercial fishing is only a century old in the province. However, aboriginal societies have relied on salmon and other fisheries resources for millennia. The aboriginal societies of coastal B.C. are noted for their elaborate social institutions. Less commonly understood is the way in which these institutions were involved in resource management. The aboriginal dependency on salmon (and other aquatic resources) for many generations caused the human societies to evolve alongside the fishery. It is reasonable to expect that these societies learned and adapted their institutions to reflect the needs of the resources.

Finally, the third Part looks at the largest and most successful example of community-based fisheries management in the world—the Japanese Fisheries Cooperative Associations (FCAs). The FCAs provide evidence that community-based fisheries management is not simply wishful thinking, but is instead the method used by a major sector of one of the world's leading fishing nations. In modernizing their fisheries at the turn of the twentieth century, the Japanese used their own traditions of management. This experience contrasts greatly with the changes in the B.C. fisheries, where industrial-scale commercial fisheries were modeled on European traditions. Canada is now faced with the courts' aboriginal rights rulings based on

aboriginal traditions and with a fishery structured around European traditions. The Japanese experience points to some interesting possibilities for reconciliation between these two competing traditions.

II. Design Principles for Community-Based Management

Researchers found common design features in examples of long-enduring, self-governing common property resource management regimes.[17] A variety of case studies noted for their success were analyzed by Ostrom and further elaborated on by Becker and Ostrom.[18]

The core problem in self-management is opportunism. However, this is not simply a problem in self-management but is also the primary focus of government's management activities. Opportunism is defined as attention to personal benefits to the possible detriment of the resource and the community of resource users.[19] There are other issues central to fisheries management, such as effects on the larger environment and the larger social community; however, this article proposes addressing those very difficult issues later. The puzzle pieces are steps of information. It is difficult enough to envision cooperation in activities that are notorious for their competitiveness. Looking for a solution to the entire puzzle at once might mean missing the key pieces that will get to the solution.

There are seven basic design principles that lead to cooperative behavior and perseverance.[20] The first principle is clearly defined boundaries.[21] The boundaries refer to both geographic and social dimensions. The people who held access rights were clearly defined, as was the territory to which the rights applied. The nature of the rights was also well understood. Simply stated, it was clear who held rights to which resources. The definition provided certainty about what was being managed and for whom. Without the definitions, people making contributions or foregoing personal benefits faced the risk that their efforts would end up in the pockets of "outsiders" or "free-riders", as they are often called.[22] This is the core solution to Hardin's *Tragedy*, the necessary condition. All of the other steps are requirements to maintain the institution.

The second core design principle is a match between contribution and benefits.[23] Community-based management requires substantial investment from all participants. This comes as a mixture of resources and time.[24] All long-enduring regimes require considerable amounts of time and effort by the membership. To be long-enduring, people need to "stay in." That is, they need to remain actively involved, and continue investing in the process. Consequently, participants must feel that they receive an equitable benefit from their contribution. Many of the design principles are necessary for the members to feel that the process is imbued with equity and fairness. Within the various regimes studied, resource allocation was tied both to the local conditions and to an individual's contribution in making the regime work.

The third core design principle is the identification of the people who have the right to adjust the operational rules.[25] In successful regimes, the right to make changes to the rules under which the system operates was limited to the members. Consequently, any ability to make changes was limited to those affected by the changes. This is a solution to one of the problems of the top-down style of management. Resource users who feel that changes are not made in response to local conditions, or that changes do not match their needs, may feel justified in ignoring the rules. In the community-based form of management, ignoring the rules amounts to cheating and risks subverting the system. Any changes to the system must make sense to the members in order for them to continue investing in the system.

Where the first three principles—clearly-defined boundaries, matching contributions, and identification of users—deal with the institutions' operational rules, the second set of principles—monitoring, sanctions, and conflict resolution[26]—are more familiar aspects of resource management. The difference from the *top-down* style of management, however, is that within the long-enduring and robust common property institutions each of these tasks is focused on the members. For example, the monitors, whether

members or people hired specifically to monitor, report back to the users.[27] In addition to oversight, the monitoring may also include biological and physical information important to management decisions. In this case, monitoring is used to collect information useful to the community of users. The resource users make decisions about precisely what information would be useful.

Violation of the rules and internal conflicts is characteristic of any system. The method of enforcement used in the successful cases was a strategy of graduated sanctions. A first infraction might be met with a warning, continuing to disregard the rules could lead to the forfeiture of rights and to the loss of membership.

With regard to conflict resolution, each of the cases used local methods with limited costs to resolve internal conflicts. Conflicts are inevitable in any governance system, due to the ambiguity inherent within defined rules.[28] Different people have varied interpretations of the rules. Contribution of labor is one example. Conflict may result from different explanations of the amount, quality, or timing of contributions.[29] An example in the fisheries context is one net blocking the efficiency of another.[30] Resolution mechanisms can be informal or formal. In many instances, community leaders assume this task along with their other roles.[31] In Japanese coastal fisheries, conflicts are resolved among fishers, and when new rules dealing with the situation can be clearly defined they are formally transcribed into a rulebook.[32]

The seventh principle is recognition of the legitimacy of the self-management system by government authorities and by other resource users.[33] Although there are well-known examples of *de facto* community resource management regimes,[34] these regimes are difficult to sustain over the long term if they are in serious conflict with government and with other users. They also generally have a reduced realm of management opportunities. Often, their efforts are limited to excluding non-members. Without formal recognition it is difficult to sustain the kinds of cooperative behavior and commitment required for the full realm of community-based resource management.[35]

Ostrom's,[36] and Becker and Ostrom's,[37] design principles include an eighth principle, which they call *nested enterprises*, for regimes that are parts of larger systems. Within these enterprises, many of the other seven design principles are "nested" within similar structures that operate at larger scales, such as regional, provincial, or national levels.[38]

III. Community Based Fisheries Management in Canada

Community-based fisheries management is nothing new in Canada. The style of fisheries management as practiced by governments in Canada during the twentieth century does not follow Ostrom's design principles. But there is an interesting illustration further back in time, when aboriginal societies were the sole resource users and managers. This Part examines fisheries management organization as developed by aboriginal societies in B.C. These forms of organization are relevant, not only because of their relation to Ostrom's design principles, but also because recent judicial decisions by the Supreme Court of Canada shifted the goals of fisheries management and profoundly altered the allocation balance of some fisheries. This Part also discusses these changes and the possible conflicts with a recent approach to fisheries management, the creation of private property rights.

The management arrangements developed by aboriginal societies are often dismissed as irrelevant because of modern fisheries management's preoccupation with levels of production. The key goals of modern fisheries science are tied to pushing the resource to produce as large a crop as is sustainably possible. Maximum sustainable yield (MSY), a term that is often used as a short-hand for this approach, was imbedded as the overreaching goal of many international fisheries agreements in the mid-twentieth century.[39] However, production is only one of several key questions involved in resource management. The value of the harvests and distribution of benefits are other issues tied to resource management.

The emphasis on production came from a particular historical experience: fisheries science emerged in conjunction with the development of preservation technology, in particular canning and refrigeration.[40] Preservation, in turn, led to global markets with a demand that far outstripped the biological supply. Most of fisheries theory developed around low-value fish available in enormous quantities, but many of these fish stocks went though enormous population changes during the twentieth century.[41] The key questions for fisheries biologists were, first, how to distinguish fishery-induced population changes from those brought about by natural causes and, second, how large a crop can be taken without causing population decline.[42]

Hardin's question,[43] however, and much of the activities of fisheries managers have had an entirely different focus. Rather than asking how much is available, their questions emphasize who can fish.[44] And, indeed, much of the management efforts of fisheries agencies focuses on regulating fishers' activities. After deciding how much, the planning moves to who, where, when, and how. The total allowable catch (TAC) question, a gentler re-formulation of MSY, is a new method of determining the catch.[45] The capacity to determine TAC, however, has had questionable successes and some notable failures.

A. Aboriginal Fisheries in Canada

Fisheries appear to be as old as humankind. The image of modern industrial-scale commercial fishing conjured up by the mention of the word "fisheries" is relatively recent. Before technology made global markets available, fisheries primarily served household needs, with surplus production traded locally. Traditional societies had answers to the organizational fisheries management questions: the who, where, when, and how. It is fair to say that traditional societies also worked out a type of answer to the quantitative question: how much, but not with the precision that we now expect of fisheries science. Rather, the needs of conservation were met by a tendency to ignore scarce resources.[46] The harvest of abundant resources was limited by a combination of proscriptions against resource waste, limited markets, and the fact that processors (generally women) were unwilling to continue working after food, ceremonial, and basic trading needs were met.[47]

1. Coastal Canada: An Overview

Coastal Canada consists of the shores of three oceans: the Atlantic, the Pacific, and the Arctic. There are two different human geographies on these shores. A significant portion of the national population lives in a few large cities and towns concentrated on a limited portion of the marine shores.[48] Conversely, small communities are scattered throughout the estuaries, bays, and inlets of the Arctic Islands, the James and Hudson Bays, the Labrador coast, the Gulf of St. Lawrence, the Atlantic shores, and the B.C. coast. Many of these communities are aboriginal. Archaeological studies tell us that these aboriginal communities have been fishing for their livelihood for thousands of years.[49] Social science research tells us that subsistence or sustenance fishing continues to be an important part of these communities' livelihood even today[50]. Since the Canadian Supreme Court's *R. v. Sparrow* decision, the rights of these groups to fish for household and community purposes are recognized as entrenched within the Canadian Constitution.[51] Beyond simple recognition, the Court declared that the right of aboriginal harvesters to fish for food has priority over all other uses, except for the conservation of the resource.[52]

Although the *Sparrow* decision established that the aboriginal right to fish for food was a priority second only to conservation, the decision was silent about commercial fishing rights. Since the *Sparrow* decision, commercial rights have been at the forefront. In 1996, the Court established tests to determine whether aboriginal groups have an aboriginal right (as opposed to a right in common) to fish commercially.[53] Since colonial days, the Crown limited the aboriginal fishing rights to mere household or subsistence purposes. Fish caught within the so-called food fisheries could not legally be sold. In effect, there are several different fisheries in Canada—aboriginal food, commercial, and recreational. The different rights, interests, and regulatory needs create a very complex slate, one in which priorities have significantly been altered by the Court's recent decisions.

Several cases addressing aboriginal rights to fish commercially came before the Court in 1996.[54] Chief Justice Lamer, in *R. v. Van der Peet*, held that *Sparrow* had left unresolved the question of how to define the aboriginal rights recognized under § 35(1) of the Canadian Constitution. In *Van der Peet*, the court ruled that for an aboriginal right to exist, the activity must have been an integral part of the aboriginal society prior to the changes that resulted from contact with the colonizing European powers.[55] Two judges dissented, disagreeing on various issues. Among these was the majority's freezing a right in time—that is, attending to a particular activity, but not the broad role that the activity played in the aboriginal society. For example, catching fish can be viewed as both providing food and as an economic activity. Limiting a fishing right to food purposes because the society did not engage in trade in aboriginal times is like "freezing a right in time." Another concern was the difficult standard of proof required for cultural understandings that pre-date European contact.[56]

In one of the cases, *R. v. Gladstone*, the Court held that the Heiltsuk[57] people did have an aboriginal right to fish, and commercially sell, herring-spawn-on-kelp.[58] The journal kept in 1793 by fur trader and explorer Alexander Mackenzie, the first European to travel overland across North America and encounter the Pacific, established that there was a large-scale trading relationship between the Heiltsuk and the Nuxalk[59] at the time. This unique and fortuitous record stemmed criticism of the Court's requirement for proof of the existence of an aboriginal right.

Most recently, on September 17, 1999, the Supreme Court released the *R. v. Marshall* decision.[60] The decision addresses a treaty right to fish commercially.[61] In a five-to-two decision, the Court found that eighteenth-century treaties between the Mi'kmaq people and the British established a right to catch and trade fish and other commodities. The court interpreted the treaty right as effectively self-regulating or self-limiting in much the same way as the food fishery. The right is limited to amounts adequate to provide families with moderate livelihoods under contemporary standards. Over the intervening centuries, aboriginal communities on the Atlantic coast of Canada have lost their position within the commercial fishery. Political and social turmoil followed the decision.[62] Before *Marshall*, no plans were developed by the federal government fisheries agency, the Department of Fisheries and Oceans, for integrating a new population into an already crowded and highly stressed fishery.

The Supreme Court's recognition of aboriginal fishing rights is more than a simple allocation change. Chief Justice Dickson, in *Sparrow*, states that:

> [Aboriginal] fishing rights are not traditional property rights. They are rights held by a collective and are in keeping with the culture and existence of that group. Courts must be careful, then, to avoid the application of traditional common law concepts of property as they develop their understanding of . . . the *'sui generis'* nature of aboriginal rights.[63]

Implicit in the judgment is a recognition of sets of values and forms of organization, namely fisheries management regimes. The structures and objectives are different from those of the commercial fisheries. The Supreme Court's ruling in *Sparrow* and subsequent cases require changes within all other fisheries to accommodate the priority of the aboriginal fisheries.[64]

There are potential benefits in these holdings beyond righting longstanding social and legal injustices. These holdings provide an important opportunity to correct management arrangements that have gone awry. Many valuable marine resources in B.C. and elsewhere are depleted.[65] The diversity of productive salmon stocks in all streams, big and small, has been reduced to a few enormously productive stocks within the larger river systems.[66] Obviously something has gone very wrong. The changes required fit within the direction of community-based management. The conditions for success in the design of community-based management are now better understood. However, before proceeding with changes, it is important to have some grounding in aboriginal fisheries management organization.

2. Aboriginal Fisheries Management in British Columbia[67]

In B.C., the market-based commercial fishery is about one hundred years old, but fisheries have been around for many thousands of years.[68] For centuries, fin fish, shellfish, and marine plants provided a primary source of food for harvesters and, in many instances, harvest surpluses were traded with other aboriginal groups.[69] Analysis of the size of the human population on the Northwest Coast prior to European contact, combined with estimates of seafood consumption, tells us that the scale of fisheries was large indeed.[70] Some researchers combine the size of the human population with estimates of annual individual consumption to conclude that total aboriginal harvests of salmon were of the same order of magnitude as those caught today in the modern fishery.[71] If the human population on the Northwest Coast was limited by the availability of food, as was often the case, this makes theoretical sense. Social scientists have long recognized the Northwest Coast as having the highest population density globally for a non-agriculturally based society.[72] The standard explanation for this is the abundance of fisheries resources, in particular the supply of salmon.

The aboriginal fisheries of coastal B.C. were organized differently than the contemporary fisheries derived from European fishing traditions.[73] The geographic scale was very different, as were the rules determining who had access. The details of the organization varied among different cultural groups. Some groups used very formal quasi-legal arrangements to limit and transfer rights of access to resources.[74] Other groups controlled access more informally by limiting the distribution of critical knowledge about the territory and its resources.[75]

Generally, contiguous territories, often consisting of a drainage area or a coastal inlet and its tributary drainages, were recognized as belonging to tribal groups.[76] The recognition came from neighboring groups and from more distant aboriginal groups that traveled the coast, as friends or as plunderers. These territories might be considered the geographic units for the aboriginal management systems. The tribal groupings were made up of kinship groups, which often resided in one large dwelling.[77] These house groups were the coastal societies' economic unit. The house groups held recognized tenures to designated areas and resources within the tribal territories, creating the basis for a group's economy.[78] The specifics of management varied among the different cultural groups, but all coastal B.C. groups appear to have had at least two institutions in common. First, territorial resource harvesting rights were held by residential corporate kinship groups; second, there was an obligation for the leaders of these groups to publicly demonstrate adequate resource husbandry through the ceremonial redistribution of harvested products.[79]

A. The Nisga'a and Gitksan Resource Management Systems[80]

For the Nisga'a and the Gitksan, land and the adjacent coastal and riparian areas were divided into territories.[81] The Nisga'a and the Gitksan are part of the Tsimshian language and culture family. The Nisga'a villages are located on the Nass River, in northwest B.C., immediately south of the Alaskan panhandle. The Gitksan are a neighboring group, with villages along the upper Skeena River.[82] Within the Nisga'a and Gitksan traditions, the territories belonged to house groups, or *wilp*, whose membership was defined by matrilineal descent rules.[83] Typically, the boundaries of a territory radiated up mountain slopes from a reach of coast or river shore framing a salmon stream. Every household had exclusive ownership rights to a territory and its resources.[84] This separation of land into controlled territories was the basis for the traditional management system for fisheries and for other natural resources.[85]

Although the house group collectively owned each territory, the chief held the actual title. The house chief enjoyed ultimate authority over the territory and its resources.[86] In consultation with his advisors, the chief was responsible for the seasonal harvesting plan, including the timing, location, and methods for the harvest.[87] The issue of quantity was more fixed than it is today in market-based fisheries. Historically, the objective was to harvest no more than was necessary to ensure the group's own food needs, it's needs for ceremonial redistribution, and, depending on the resource, a quantity surplus for trade with neighboring groups.[88] The B.C. coast is marked with deeply-incised trading trails for transporting sought-after coastal foods, such as eulachon grease, across the coastal mountains to trade for specialty products from the Canadian interior.[89]

The chief also permitted non-members to harvest quantities surplus to the group's own needs and to the chief's estimate of the amount needed to maintain the territory's resources.[90] With the larger rivers and the more productive resource areas, an open-access system prevailed. However, even though people were free to harvest for their own immediate needs, specific rights or permission were necessary to set up smokehouses or other preservation facilities.[91] This was the critical tool to assure both generosity and the degree of control required for effective management.

This system had a high degree of formality. Although outsiders were free to travel through the area, it was illegal to harvest fish or other resources (other than for immediate need) without permission. Enforcement was based on the severity of risk, rather than a dedicated patrol of boundaries. House members who found transgressors making use of the resources without permission were well within their customary rights to kill the offender. The severity of these laws required that people be knowledgeable about the boundaries of the territories to which they had rights of access. Displaying the boundaries was part of the Nisga'a and Gitksan *potlatching* tradition.[92] This was the means through which the general members learned about the geographic limitations of their rights. However, the formal set of knowledge about the territory, which included the territorial boundaries, its resources, and the history of the group's tenure, belonged to the chief. Within the system, the right to publicly recite this knowledge amounted to title to the territory.[93]

B. The Kwakiutl Resource Management System

The Kwakiutl are the native people of the northern part of Vancouver Island and the adjacent mainland inlets.[94] Their name is, perhaps, better known by the general public than that of any other Canadian aboriginal group due to the role they played in the development of early anthropology. Ironically, knowledge of the Kwakiutl system of resource management is less complete than that of the Nisga'a and Gitksan peoples.[95] The system has some similarities, but it also has significant differences. As with the Nisga'a and the Gitksan, the ownership of land and resource harvesting rights belonged to the house groups, or *namima*.[96] Each tribe consisted of a number of ranked house groups that owned neighboring territories and which wintered together in a tribal village. From the available anthropology literature, it appears that the Kwakiutl system was a complex mixture of territorial tenure and specific resource harvesting rights on other tribes' territories.[97] Franz Boas left some enticing maps of namima tenures to ground fish sites and a detailed map of the head of Knight Inlet showing the complexity of Kwakiutl estuarine and upland resource harvesting rights.[98]

Title and responsibility for the house group's properties were vested in the chief. Interests in these properties were two-fold: the group's territory and its place in Kwakiutl society.[99] As official owner of the lands, and as provider of its resource richness through his connection with the spirit world, the chief received a portion of all harvests. The chief's portion, a type of taxation, was used to finance the group's ceremonial obligations.[100]

The record left by turn-of-the-twentieth-century anthropologists gives important insight into a remarkably sophisticated resource management accountability system. There is reason to believe that this technique was not limited to the Kwakiutl, but it may have been a general role of the potlatch and redistribution feasts prevalent throughout Northwest Coast societies.

The accountability system worked through the potlatch. Among the many functions it performed within the Kwakiutl society, the potlatch also operated as a monitoring device.[101] The anthropological record shows that prior to the fur trade and the major social disruptions resulting from European contact, the amounts of goods distributed during Kwakiutl potlatches were quite stable.[102] That is, prior to and during the early phases of contact, the potlatches were essentially non-competitive. The competitive potlatching that is now commonly associated with the term appears to be a product of the major post-contact social changes within Kwakiutl society.[103]

Accountability depended on the hierarchical system of social ranking and status within Kwakiutl society. Each namima and its chief had a rank within the potlatching confederacies of Kwakiutl tribes that potlatched together.[104] Traditionally, the goods distributed during a potlatch were produced by the group from their territory's own resources.[105] The natural wealth of the namima's lands had to be carefully managed to ensure a constant renewal of resources, thereby guaranteeing a continued place in society.[106] Part of Kwakiutl tradition was the right of people to live with any namima (and therefore harvest its lands and waters) to which they had an affiliation. This residential mobility influenced the behavior of chiefs, as their otherwise potentially autocratic rule was under a constant threat of possible loss of rank. As a result, chiefs were just as dependent on their house co-workers as the co-workers were on the chiefs. Without adequate redistribution of resources, a chief would see the rank of his inherited status decline.[107] Essentially, the chiefs and house groups had to operate as effective resource managers or lose status.

In this way, the potlatch gifts acted as a monitoring system for the chief's ability as a human and resource manager. Status changed only if the chief showed that he was not able to properly manage the group's human and natural resources. The potlatch, combined with social ranking, acted as a fully-integrated monitoring and public accountability process that would be the envy of many modern resource managers.

C. Differences between Aboriginal and Present-day Management

Resource management by coastal B.C. aboriginal societies was organized very differently than it is today, creating an interesting match with Ostrom's design principles. Geographic and social boundaries were notably well-defined. Further, there was a connection between people's contributions and their benefits.

One major difference between the aboriginal design and modern management can be seen in the scale of management units. Tribes and their member houses relied on local territories. Each house had access to a local salmon stock and a mixture of local shellfish and upland animal and plant habitats. With unique or limited resources, such as eulachon runs[108] and major salmon rivers, permeability to the limited access territorial system was developed through the granting of specific harvesting rights to linked groups.

Another difference between past and present is illustrated by the aboriginal management operating through resource users, rather than by a professional class of managers.[109] This original community-based management included various types of accountability. The aboriginal group's livelihood depended on the resources that they managed. If they over-harvested or damaged the habitat, dire consequences followed. However, the consequences went beyond the economic. The larger society used the potlatch gifts as an indicator of the quality of life within different houses, and this, in turn, served as a monitoring mechanism. Houses that were not able to produce lost social status—a particularly onerous penalty in hierarchical societies. Ultimately, the system was based on an ability to exclude non-members, which is the primary condition for avoiding Hardin's *Tragedy*.[110]

B. Modern Fisheries in Canada

With the assumption of British and, later, Canadian sovereignty, B.C. was reconstructed as a frontier region. Indigenous resource management systems and the tenure arrangements on which they were based were ignored as the province was re-drawn as a blank slate by colonizing powers. Ideas of property drawn from the British legal tradition were imposed over the pre-existing aboriginal framework.[111] Based on these ideas, property could take two forms: title held by the Crown or, instead, ownership alienated from Crown title to private parties.[112] Mobile resources, such as fish and wildlife, remained Crown property until caught, at which point those resources became the sole property of the harvester.[113] In general terminology, fish and wildlife became common property resources. However, those resources essentially remained the property of the state, which created various regulations permitting them to become publicly harvestable.[114]

The aboriginal system was also based on property arrangements, but took a very different shape.[115] Aboriginal relationships are often characterized as people belonging to the land, rather than land or resources belonging to people. Resources, however, were community property, and access to them was provided to all community members. Therefore, resources belonged to the community, defined variously depending on the indigenous legal definition, but could not be alienated.[116] Rights of access for use could be transferred within the community, again according to the cultural legal rules, but these rights could not be sold or exchanged outside the community.[117] This is a familiar form of property ownership within many indigenous cultures globally, but it did not fit under British common law. When the Japanese were looking for a legal model for their community land and sea commons during the late nineteenth century, they went beyond the British Isles and incorporated elements of the Napoleonic Legal Code.[118]

Looking broadly, property rights can take three shapes: crown or state property, private property, or communal property.[119] The first two are well known throughout North America. The third, community property, is a familiar concept to North American aboriginal societies, and within many nation states.[120] Much of the current legal dilemma in Canada concerning aboriginal rights is an effort to reconcile community property concepts within a legal framework that is based on notions of private and state-owned property.

1. Fisheries Management in British Columbia after Western Settlement

It is valuable to examine the history of B.C. fisheries management, and particularly recent directions in that management, within this legal framework. Since early settlement, land and resources have moved in the direction of private property.[121] After the state assumed sovereignty, the land and resources of B.C. became Crown property. To encourage settlement and investment, the state created laws and opportunities for alienation of ownership from the Crown to private parties.[122] These included land grants and a variety of resource tenures. Under the resource tenures, the Crown continued to own the land or waters, but the rights to use or harvest specific resources were granted to private parties.[123] During the early stages of settlement, resource rights included timber tenures, as well as mineral and water rights.[124] The conditions associated with the tenures varied. Some early timber tenures had a time limitation,[125] but after provincial authorities realized that this condition led to high grading of the most valuable timber, they removed this limit, and the rights to the tenures were made renewable and transferable.[126] The consequence of this measure was to create private property in tenures, that is, the access rights to resources could be bought and sold.

Fish, wildlife, and marine waters remained common property resources for a while. However, beginning with the registration of traplines in 1926 this changed,[127] and today, an ever-decreasing portion of resources remains within the common property pool.[128] The creation of private property rights to land and resources was largely limited to the land until fairly recently.[129] British Columbia commercial fisheries were essentially open-access, requiring only the purchase of an inexpensive personal license until the 1960s when the government introduced an innovative, limited license program in the salmon fishery.[130] The objective was twofold: to reduce the fishing power of the fleet, and to eliminate part-time harvesters and create a more prosperous class of full-time professional fishers.[131] Fishers with threshold-sized harvests qualified for licenses, but others could purchase these rights from the license holders.[132] At first, licenses allowed the license-holders to fish salmon anywhere on the coast. Over time, however, geographic restrictions were added. Presently, licenses are restricted to specific sections of the coast.[133] To fish the entire coast requires the purchase of multiple licenses. Since the early salmon and halibut limited licensing scheme, many other fisheries have been structured on this model. Licenses are granted to fishers with a significant record of harvest, and the licenses are transferable—consequently representing a form of private property.[134]

Numerous problems resulted from the licensing program. Provisions to transfer licenses between boats resulted in the construction of new boats incorporating advanced technology that significantly increased the fleet's fishing power.[135] The elimination of part-time fishers left many isolated aboriginal communities

without the boats they previously relied upon to harvest sea resources for food purposes.[136] As the resource increased in value, so too did the value of licenses.[137] For the people grandfathered into the previous regime, the costs were negligible. But for young people looking for entry, the costs required hefty loans for both a fishboat and a license. Few individuals can afford such a large investment and many people fear that the commercial fishery will end up owned by a few ultra-wealthy individuals or corporations.[138]

2. Recent Developments in Modern Fisheries Management Systems

The fear of corporate consolidation of fishing rights is further exacerbated by recent developments in fisheries management systems in Canada and elsewhere. The solution to Hardin's problem[139] offered by many Western economists and politicians is to change a common property resource into private property.[140] Individual transferable quotas (ITQs) presently operating in several B.C. fisheries (e.g., black cod and halibut) pose interesting solutions to classical fisheries problems, but introduce a new set of difficulties by potentially concentrating the resource into a few individual or corporate hands.[141] If restrictions on the sale of the rights are not keyed to residency or citizenship, it is possible that the fisheries resource and its benefits will be largely owned by foreign, off-shore interests in the same way that much of B.C.'s forest rights are.[142]

These concerns apply to the marine aquaculture industry as well as to ITQs, because aquaculture operations require an "aquatic Crown land tenure" to proceed.[143] Aquaculture is a recent development in B.C. and throughout Canada. Generally speaking, aquatic organisms are raised from young stages to mature, marketable size. In this respect, aquaculture has greater similarities to farming than it has to fisheries. It may or may not make use of a native species, and at the very least, the industry simply occupies marine space.

Within B.C. waters, the salmon aquaculture industry has very rapidly become a major part of the seafood industry. In 1997, B.C. was the fourth-largest producer of farmed salmon in the world.[144] During that year, cultured salmon matched the landings of wild salmon and amounted to sixty-two percent of the value of all salmon produced.[145] The industry, however, has been fraught with controversy, particularly over the impact of escaped Atlantic salmon, the preferred species of the B.C. industry.[146] While many voice fears about the effect on the native salmon populations should escaped Atlantic salmon adapt to the Pacific ecosystem, answers can only come from continuing the unintended experiment. Reassuring voices are betting on low probabilities that Atlantic salmon will be able to adapt biologically to the Pacific. However, given sufficient time and large enough numbers, the odds increase that the Atlantic salmon will adapt to the Pacific environment.[147]

Another set of concerns about aquaculture is not often addressed—namely the possibility of the industry following the same course of private property concentration as other resource-driven industries. At the earliest stage salmon farms were envisioned as fitting into the settlement traditions in B.C. as marine versions of family homesteads. Instead, salmon farms are owned by multinational corporations listed on stock exchanges throughout the world. With a few exceptions, the benefit to local communities is limited to possible employment opportunities. The rights are alienated from the Crown as private property tenures, transferable to other parties.[148] Aquaculture appears to be following the same ownership pattern as the early forestry tenure model.

Private property and corporate consolidation models are very familiar. The difference here is that they appear to be expanding into the marine fisheries and environment sectors. Within Western traditions, with some exceptions,[149] these areas historically are common property zones. This development is comparable to the eighteenth and nineteenth century enclosures of the agriculture commons in England.[150] During the enclosures, large numbers of independent English farmers were displaced from the countryside while the land holdings of the wealthy increased.[151]

However, there are interesting and instructive alternatives to the private property approach. These alternatives focus directly on the major questions concerning resource management with which Western traditions seem to have a great deal of difficulty, such as: what the purpose of the fisheries is and who should benefit from them. These alternatives have had a great deal of success in reserving local resources for local inhabitants, which is a critical shortcoming of converting a common property resource into private property.

The B.C. aboriginal fisheries model provides a variety of useful lessons, particularly in the way that it matches the broad outlines of Ostrom's design principles for successful community-based resource management.[152] But the aboriginal model was not geared towards a full-fledged market economy, and it depended on a kinship-based customary legal system. There are still important lessons that can be taken from this model, however, including the scale of the management unit, the commitment to local resources, and the development of complex accountability institutions.

Further afield, when the Japanese modernized their fisheries they turned to their own traditions, incorporating an indigenous system based on the ownership of fishing rights by community fishing coop-eratives. There is also an instructive match between the organization of these fisheries and Ostrom's design principles. Although the Japanese may have a questionable record in some areas of resource and environmental management, they are without a doubt the most successful example of community-based commercial fisheries management.[153]

IV. Community-based Fisheries Management in Japan[154]

One important lesson the Japanese learned is to sort fisheries into three regulatory groupings.[155] By doing so they avoided many of the questions frequently encountered by other people pondering community-based fisheries management alternatives. Rather than addressing a multiplicity of resources, many of which are inherently difficult to manage in any form, the sorting identifies fisheries resources that may benefit from greater ties to a local community of users. The offshore, distant fisheries are managed in much the same way as other developed countries. These are fisheries subject to many regulatory problems for which community-based management provides few possible solutions.[156]

The same can be said of the deep water pelagic and migratory resources within the Japanese 200 nautical mile Exclusive Economic Zone (EEZ).[157] The oceanic and deep-water fisheries are managed by licenses granted to companies and individuals. Community-based management does not play a role in either of these types of fisheries. In Japan, community-based management is limited to the inshore fisheries—the zone of sedentary and more resident fisheries resources—because that is the area where it is the most effective.

A. Historical Community-based Management in Japan's Inshore

In the inshore, the Japanese have a long history of community-based fisheries management.[158] In some notable instances, the record goes back nearly a thousand years.[159] When the Japanese re-established contact with global trade in the late-nineteenth century after centuries of self-imposed isolation, they sought out new institutional models. Their approach was strategic, as other Asian nations' colonial or dependency status provided a powerful reminder of what precisely was at risk. Young people were sent to the colonizing powers in Europe and North America to learn the most modern governance, economic, educational, military, and technological methods.[160] The Japanese studied Western resource management methods along with banking and shipbuilding.[161] This strategy of incorporating Western models proved largely successful.

One notable failure, however, was in fisheries management. The fisheries were restructured on an open-access basis, more in keeping with Western traditions than those of the Japanese.[162] The ownership of all fisheries reverted to the national government in 1875.[163] Rather than following their own traditions of limiting access in the local inshore fisheries to the adjacent fishing communities, the new laws opened

access to outsiders. Fisheries became open to all based on the payment of a fee.[164] Presumably, the Japanese were following the Western tradition of using economic competition to promote efficiency and attract outside investment. The resulting chaos, which reigned for a brief period on the fishing grounds, passed when the laws were rescinded and restructured along more traditional lines.[165] The source of the chaos was familiar. Impoverished local farmers and people with access to capital, newcomers to the fisheries, saw a new opportunity and took advantage of it. The degree of conflict that resulted induced the government to drop its revolutionary measures and reconsider the traditional system.[166]

The Japanese returned to community-based coastal fisheries at the turn of the twentieth century by making cooperatives the unit of fisheries organizations. Following the disruptions of the 1870s, the management of the fishing grounds reverted to prefectures, the administrative units that had replaced the feudal fiefs.[167] In 1881, the Ministry of Agriculture, Commerce, and Administration created a set of rules, known as the Standard Rules for Fisheries Association, to establish fishing cooperatives as the organization responsible for "coordinat[ing] the use of coastal fishing grounds."[168] The cooperatives derived from the earlier fishing guilds.[169] Guild membership was limited to those people born in a fishing village. The guilds enacted rules regarding gear, season, and fishing areas, and enforced the rules through social sanctions.[170] The cooperative associations were modern versions of the guilds, with membership based on residency and a period of apprenticeship in the fishery.[171] The first fisheries law was passed in 1901.[172] "The Old [Fisheries] Law was Japan's first piece of modern day legislation based purely on Japanese ideas, while the other laws were modifications of European models."[173] The principal purpose of the 1901 Fisheries Law was to ensure order and peace within the inshore.[174] The law's requirement that exclusive rights would only be granted to a Fishery Society, the early version of Fisheries Cooperative Associations, led, in turn, to exclusive rights to fish within local inshore waters being granted to village fishing cooperatives.[175]

As far-sighted as these measures may seem, serious problems developed over time. Poor fishers remained poor as the need to invest in new technology created heavy debt and the effective transfer of rights to brokers and moneylenders.[176] The transferability of the rights created a class of absentee tenure owners. This was rectified during the general reform of Japanese law that followed World War II.[177] In particular, the new fishing laws[178] made the inshore rights inalienable. The rights remain with the fishing cooperative[179] and people obtain rights of use through membership in the organization.[180] Personal membership is no longer transferable. New members gain entrance by following a set of rules specified by each cooperative. The effective transfer of rights to secure loans also ceased.[181] During the 1930s, the government encouraged the cooperatives to enter marketing. The modern versions of the cooperative, the Fisheries Co-operative Associations (FCAs), are regionally and nationally linked organizations that are actively engaged in product marketing, the supply of fishing gear, and banking, in addition to fishing.[182]

B. Modern Fishing Rights and Fisheries Management in Japan's Inshore

A complex web of fishery rights governs the use of inshore waters.[183] While only the FCAs can hold certain types of rights, FCAs, fishing companies, or individuals can hold other types of rights.[184] Joint rights to small-scale benthos, net, and trap fisheries are granted to FCAs by the prefectural governments, the Japanese equivalent of the state or provincial levels of government. One right is granted for each type of resource and each territory.[185] Rights for aquaculture within the marine tenure waters are only available to the FCA.[186] The FCA or private interests can hold rights in the inshore for large-scale, capital intensive, set-net fisheries.[187]

The rights structure only creates the conditions for management. It is equivalent to Canadian licensing, structured with a different set of priorities. The rights establish the rules governing who has access to the fisheries and who stands to benefit.[188] But other arrangements are required for the actual management of the resource. The operational rules of each fishery come from the interactions of joint government and community fisheries regulatory commissions, government technical staff, as well as individual cooperatives and their fishery groups.[189] The commissions make decisions about the granting and renewing of fishing rights. They also make recommendations about fishing plans, generally with input from government

technical staff.[190] However, the cooperatives are the primary management authority.[191] They are responsible for formulating a fishing plan for each right that they own; however, they are required to listen to the other parties.[192] But they often impose more stringent limitations than required by the commissions.[193] In addition, they are able to respond to local concerns because they rely on the knowledge of their fishers about local happenings and conditions.[194]

The Japanese plans have a different feel than Canadian fishing plans. Because the fishing community creates the plans, Japanese plans are more economic in their primary focus. The inshore resources often have very high value, and the Japanese market has a very sophisticated approach to resource quality.[195] In addition to handling, the size of the product has an implication for quality, and consequently, to its value. Quantity, of course, is an issue. But these are not fisheries driven by maximum sustainable yield formulas. Rather, decisions are based on what fishers are experiencing on the grounds.[196] Government scientists make some stock assessments and provide recommendations, but fishers also rely on their own less quantitative readings of the resource to make decisions. Because the fishery has a local territory structure, any mistakes are borne by the people who make them. This is obviously the most powerful form of accountability, and it matches well with Ostrom's design principles.[197]

Many of the classical fishing problems result from conflict and competition among fishers.[198] Powerful and instructive lessons have been learned about how to deal with these types of problems. The Japanese inshore management solution has not eliminated conflict and competition as groups of fishers are still speeding to harvest first. The scale of the competition, however, is very much reduced. Conflicts are still inevitable, but are managed by a reduced numbers of players, by members of a fishing group being socially linked, and through some conflict resolution formalities.[199]

The FCA's fishing groups are its informal level of management. Fishing groups consist of fishers who are involved in the same fishery, who live in the same neighborhood, or who tie up at the same dock.[200] They fish on a common fishing ground. This is a tightly linked social group,[201] and problems are quickly identified and dealt with to insure peace within the immediate group. Conflicts are brought to group meetings in which each fisher represents themselves. There is no delegation of authority, solutions are developed by consensus.[202] Bad feelings are salved over by socializing, and fishing group members often call for food and liquor after struggling for resolution. Formal solutions go into a fishing rulebook, which is a record of internal dispute regulation.[203]

Generally, solutions to difficult problems involve different forms of benefits sharing.[204] This concept is based on each member having equal rights to benefit from the fishery.[205] However, even though each person has equal rights, there are differences in the investment of effort. In the Japanese inshore, effort is not limited to fishing; it also includes management tasks, such as poaching patrols, enhancement, predator control, cooperative committee work, and attendance of a wide variety of meetings.[206] Formulas for fair sharing may take different types of effort into account.[207]

The cooperatives have formal rights to manage all areas of the fisheries, except for habitat issues.[208] Japanese law is complicated in this area; it provides compensation rights for habitat uses that conflict with the livelihood of fishers, while it also gives fishers some say over development of the inshore.[209] Developers must buy out the rights of the cooperative;[210] however, in the real world there are limitations in the ability of cooperatives to say no as the government's ideas of the greater good may prevent cooperatives from being able to veto developments.

The macro-level indicators identify the Japanese inshore fisheries as a sustainability success story.[211] The number of people and fishing communities involved in this kind of management in Japan is impressive. The Japanese have long since passed through the pilot project stage, as several thousand fishing communities and hundreds of thousands of fishers are involved in this form of fisheries management.[212] With these kinds of numbers, it is not a simple job to assess outcomes. Some communities and their fisheries are in decline from pollution, migration to urban areas, and general economic

problems.[213] Macro-level indicators from 1989, however, suggest that these are the exception, and that the inshore fishery is very healthy indeed.[214]

V. Conclusion

This article's objective was to present some pieces for solving the puzzle of community-based fisheries management. The pieces were somewhat long and complex. There are two possibilities for understanding these pieces. The first is that the pieces create a story in and of themselves. The second is that the pieces are more than the sum of their parts.

With the first possibility, the pieces may actually be linked as part of a story in their own right. Community-based management is nothing new in Canada or elsewhere in the Americas. It becomes a novelty only if the millennia of history are ignored by re-constructing the story as the history of European settlement. In making changes to resource use and management, the Canadian government followed European traditions. The scale of access and management followed the political map rather than the biology of the resources, and the lessons learned by aboriginal societies were simply discounted. The resource management knowledge and creativity of these societies must be honored rather than ignored. If resource managers had followed this learning, salmon fisheries might have been structured run by run, fished at river mouths, rather than by costly boats intercepting mixed stocks of salmon on their way to the river mouths. The Japanese reverted to their own fishing traditions when modernizing and redeveloping a commercial fishery in the inshore. The result is the largest and one of the most outstanding success stories in fisheries management.[215] Each of these stories, the aboriginal fishery and its subsequent redevelopment and the Japanese inshore, fits within Ostrom's principles, both for conditions of success and for situations that led to failure.[216] It is obviously very tempting to continue looking at the history of fisheries management using these pieces.

The second possibility is that the pieces represent information about alternatives to the way that coastal resources are managed in Canada and other parts of the Western world. They may provide a potential for solving the whole puzzle, but the shapes of these pieces do not fit well into the puzzle as it is presently configured. The shape of the puzzle may have to be changed significantly to make use of these pieces. From the discussion above it should be very clear that fisheries management is more than stock assessment and the creation of fishing plans. The public perceives that fisheries management is biological. It is instructive, therefore, to look carefully at the notable reasons for fisheries failures.[217] The failures are not only due to the managers' lack of adequate information about the resource. Pinkerton and Weinstein list nine "great socio-political problems in fisheries management."[218] The more familiar of these problems include:

- Confusing public policy and values with the interests of powerful actors;
- The compliance/enforcement problem;
- The problem of too many big and powerful boats;
- Defining boundaries and access;
- Uncoordinated strategies; and
- Inter-government conflict.

The less familiar problems include:

- Undervaluing or ignoring human capital (i.e., the knowledge that communities of users build over long periods of time);
- Passing the costs of fish habitat protection on to the fishing communities and the more general public (i.e., when figuring costs, ignoring what economists term externalities); and
- Ignoring supply management, product quality, and product diversity issues (i.e., disregarding the economic return to the fishers in favour of the volume of the harvest).[219]

Obviously, if we are not to repeat our record of collapse after stock recovery, some serious reform is required.

The pieces provide this opportunity for serious reform. There is now a great deal of knowledge about the design of community-based management institutions that lead to co-operation and to success in the management of resources. Ostrom's principles provide answers to most of the nine "great problems" and point the way to answering the most intractable problem: "passing on the costs of fish habitat protection to fishing communities and the public."[220]

While the Japanese inshore model is not something that can be moved directly into Canada or elsewhere in North America, there are elements of the model that can be universally employed. In B.C., for example, much of the thinking about fisheries is dominated by the problems of salmon. Yet the province's resource base is considerably more diverse than salmon.[221] Many fisheries resources can be managed by defining "boundaries." It is difficult to envision complying with the legal directives that came down in *Sparrow* and the other aboriginal rights fishing cases without defining boundaries in Ostrom's sense. These cases are significant opportunities for restructuring fisheries more in keeping with the resource, and more in line with the objective of local resources benefiting local communities.

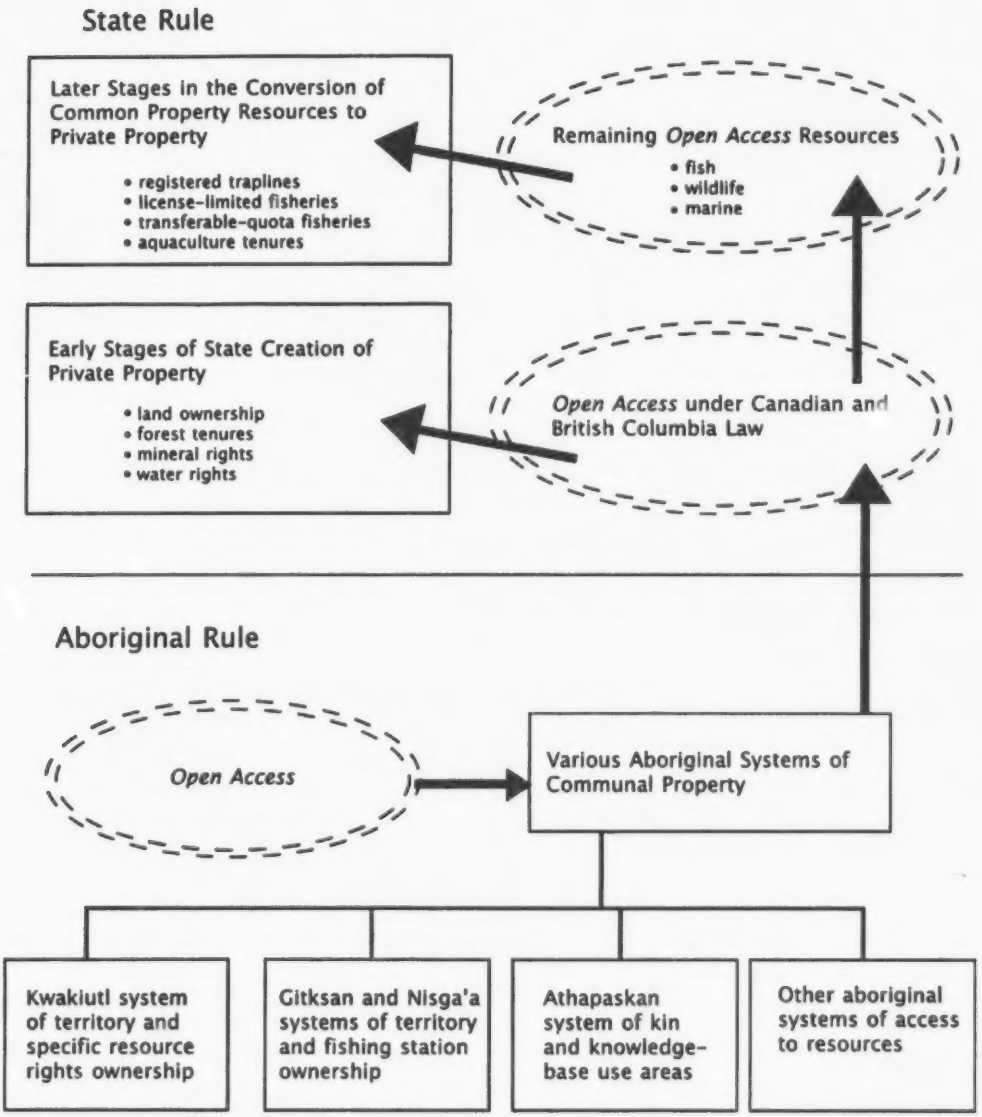
These opportunities also apply to the Pacific salmon. Restructuring must go beyond the immediate problems of the salmon fishery, which are perennially so compelling that management never seems to get beyond the current year's needs. The tragedy in the salmon is not the risk of extinction of a few coho stocks. Rather, it is the loss of salmon stock diversity in B.C. that has been a continual process.[222] The recent fishery relies on very few stocks compared to the diversity of the not-so-distant past. There are many B.C. First Nations[223] that cannot obtain their food salmon from the same stocks on which they historically relied.[224] The stocks are simply depleted, principally because of the interception style of fisheries management practiced in Canada for most of the twentieth century.[225] Theoretically, before the stock depletion, it might have been possible to organize community-based commercial salmon fisheries in B.C. using similar boundaries to those used by the Kwakiutl or the Gitksan or the Nisga'a. After recovery, it might be possible to reshape the fisheries in this form.

However, the historical direction towards the creation of private property in resources rather than community property seems to be continuing.[226] The recent Canadian government salmon buy-back/area licensing program,[227] whether intentionally or not, appears to be headed in that same direction. These pieces of the puzzle, however, say that the direction of privatization is not the only direction available, and they provide information about benefits to the resource as well as the community that emerge from ties between local residents and regional resources. Finally, recent legal developments in aboriginal rights demonstrate that the courts are trying to reconcile private and community property concepts,[228] both of which now exist within Canadian law.[229] Within this difficult marriage there may be an opportunity for the legal recognition of community interests in fisheries resources.

Appendix 1: Design principles for robust and successful common property resources institutions.[230]

	DESIGN PRINCIPLES	DETAILS	CPR PROBLEM	SOLUTION
CORE PRINCIPLES	1. Clearly defined boundaries	Boundaries of the resource systems and the parties that have usage rights are clearly defined.	Free ridership	Limiting access
	2. Match between contribution and benefits	Rules for individual resource allocation (or benefits) are tied to local conditions and to rules for contribution (of labor, materials, and cash.)	Accountability	Fairness
	3. Users define rules for changing system	Individuals who are affected by the rules and who have the most information (about the environmental and social system) are involved in making changes to the rules.	Changing conditions	Users redesign rules
KNOWLEDGE AND AGREEMENT	4. Monitoring	Users monitor physical/biological conditions. Users monitor users' behavior. (Or they hire people to do the monitoring.)	Monitoring	Users define information needs
	5. Graduated sanctions	Users who violate rules receive graduated sanctions from other users; officials are accountable to users or both.	Enforcement	Graduated penalties
	6. Conflict resolution methods	Rapid access to low-cost, local methods to resolve conflicts (between users or between users or officials.)	Internal conflict	Internal conflict resolution
RECOGNITION	7. Outside recognition of rights	Rights of users to create their own institutions are not challenged or subverted by government authorities or by other resource users.	External conflict (invasion, annexation, subversion)	External, as well as internal legitimacy
	8. Nested enterprises (i.e., linkages)	All of the above functions organized in multiple layers in the case of institutions that are part of larger systems.	External conflict (undefined boundaries)	Resilience through institutional complexity

Appendix 2: A model of the history of B.C. resource access.[231]


State Rule
Later Stages in the Conversion of Common Property Resources to Private Property
• registered traplines
• license-limited fisheries
• transferable-quota fisheries
• aquaculture tenures
Remaining Open Access Resources
• fish
• wildlife
• marine
Early Stages of State Creation of Private Property
• land ownership
• forest tenures
• mineral rights
• water rights
Open Access under Canadian and British Columbia Law
Aboriginal Rule
Open Access
Various Aboriginal Systems of Communal Property
Kwakiutl system of territory and specific resource rights ownership
Gitksan and Nisga'a systems of territory and fishing station ownership
Athapaskan system of kin and knowledge-base use areas
Other aboriginal systems of access to resources

Appendix 3: Legal fishing rights and licenses in Japan.[232]

CATEGORIES	GRANTED TO
RIGHTS	
1. Common Fishing Rights Type 1. Right to gather seaweed, crustaceans, mollusks, and other benthos within a given FCA territory, generally extending 1-3 km from the coast.	Exclusively to Fisheries Co-operative Associations (FCAs).
Type 2. Specific small-scale trap and set-net fisheries for crustaceans, fishes, and mollusks within the FCA's territory.	Exclusively to FCAs.
Type 3. Beach seines, unmotorized trawling, and fish shelters for various species within the FCA's territory.	Exclusively to FCAs.
2. Aquaculture Right Right to use a portion of the FCA's territory for aquaculture operations: the right specifies which species can be cultivated.	Exclusively to FCAs.
Pond aquaculture right: this right that covers a limited operation in a fixed site has low potential for conflict with other users.	To FCAs, private organizations, and individuals.
3. Large-scale Set-net Fishery Rights Capital intensive stationery nets for pelagic fish, including herring, salmon, and tuna.	To FCAs, private organizations, and individuals.
LICENSES	
1. Prefectural fishing license Nearshore, small-scale operations in a prefecture's sea area.	To FCAs or individuals.
2. National fishing license Sea area offshore of more than one prefecture: generally, these are medium-scale operations in deep waters.	Mostly to private organizations and individuals.
3. Global fishing license Distant waters, large-scale operations in high seas areas or the EEZs of other nations.	Mostly to private organizations and individuals.

Endnotes

1. *See, e.g.*, NATIONAL ROUND TABLE ON THE ENV'T AND THE ECON., SUSTAINABLE STRATEGIES FOR THE OCEANS: A CO-MANAGEMENT GUIDE (1998); CANADIAN DEP'T OF FISHERIES AND OCEANS, PARTNERING THE FISHERY: REPORT OF THE PANEL STUDYING PARTNERING (Donald J. Savoie et al. eds., 1998); INTERNATIONAL INST. OF RURAL RECONSTRUCTION, PARTICIPATORY METHODS IN COMMUNITY-BASED COASTAL RESOURCE MANAGEMENT (1998).
2. *See, e.g.*, MICHAEL BERRILL, THE PLUNDERED SEAS 1-4 (1997); BRITISH COLUMBIA FOREST RESOURCES COMM'N, THE FUTURE OF OUR FORESTS: EXECUTIVE SUMMARY 33 (1991); CHERI BURDA ET AL., FORESTS IN TRUST: REFORMING BRITISH COLUMBIA'S FOREST TENURE SYSTEM FOR ECOSYSTEM HEALTH 36-38 (1997); GOVERNMENT OF BRITISH COLUMBIA, COASTAL ZONE POSITION PAPER 2 (1998).
3. *See, e.g.*, Colin W. Clark, *The Economics of Overexploitation: Severe Depletion of Renewable Resources May Result From High Discount Rates Used by Private Exploiters*, 181 SCIENCE 630 (1973); Donald Ludwig et al., *Uncertainty, Resource Exploitation, and Conservation: Lessons from History*, 260 SCIENCE 17 (1993). *See also* Kai N. Lee, *Greed, Scale Mismatch, and Learning*, 3 ECOLOGICAL APPLICATIONS 560 (1993) for a more optimistic approach to these problems.
4. *See, e.g.*, CO-OPERATIVE MANAGEMENT OF LOCAL FISHERIES: NEW DIRECTIONS FOR IMPROVED MANAGEMENT AND COMMUNITY DEVELOPMENT (Evelyn Pinkerton ed., 1989); ELINOR OSTROM, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION (1990).
5. *See* CANADIAN DEP'T OF FISHERIES AND OCEANS, *supra* note 1, at 9.
6. *See* Garrett Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1243 (1968), *reprinted in* MANAGING THE COMMONS 16 (Garrett Hardin & John Baden eds., 1977).
7. *See id.*
8. *See id.*
9. *See* Judith Lavoie, *Report: Put Community in Control*, VICTORIA TIMES COLONIST, July 28, 1995, at A9.
10. The Association's Mission Statement reads:

> The International Association for the Study of Common Property (IASCP), founded in 1989, is a nonprofit Association devoted to understanding and improving institutions for the management of environmental resources that are (or could be) held or used collectively by communities in developing or developed countries. With more than 800 individual members and 1,500 institutional members, IASCP includes scholars from a variety of disciplines who are educators, researchers, practitioners, government officials, and students.

About the International Association for the Study of Common Property (visited Jan. 19, 2000) <http://www.indiana.edu/~iascp/brochure.html>.

11. Ironically, at a time when natural resource issues featured very prominently in the public media, there was a very limited attendance by British Columbia residents. The lack of attendance by biologists might also be an important indicator that these scientists, whether teaching at universities or managing resources for governments or corporations, still feel that solutions to management problems can come from knowledge about the resource alone.
12. There are several useful collections of papers that emerged from the early efforts in this field. *See, e.g.*, COMMON PROPERTY RESOURCES: ECOLOGY AND COMMUNITY-BASED SUSTAINABLE DEVELOPMENT (Fikret Berkes ed., 1989); MAKING THE COMMONS WORK: THEORY, PRACTICE, AND POLICY (Daniel W. Bromley ed., 1992); THE QUESTION OF THE COMMONS: THE CULTURE AND ECOLOGY OF COMMUNAL RESOURCES (Bonnie J. McCay & James M. Acheson eds., 1987).
13. *See* FENTON MARTIN, COMMON POOL RESOURCES AND COLLECTIVE ACTION: A BIBLIOGRAPHY (3d ed. 1989) (listing 4975 academic references dealing with this topic, a significant number of which are case studies while others are review articles and theoretical analyses); *see also* CHARLOTTE HESS, COMMON POOL RESOURCES AND COLLECTIVE ACTION: A BIBLIOGRAPHY (4th ed. 1998). The combined number of citations now numbers approximately 20,000. *See About the CPR Bibliography* (last modified June 5, 1998) <http://www.indiana.edu/~iascp/aboutbibs.html>.

14. *See, e.g.*, OSTROM, *supra* note 4; 4 J. THEORETICAL POL. INSTITUTIONS & COMMON-POOL RESOURCES (Elinor Ostrom ed., 1992).
15. *See* discussion *infra* Part III.A.1.
16. The combination of the two arriving at the same time compounds the conflicts and makes the issues, at times, highly confrontational.
17. *See* OSTROM, *supra* note 4, at 88-102; C. Dustin Becker & Elinor Ostrom, *Human Ecology and Resource Sustainability: The Importance of Institutional Diversity*, 26 ANN. REV. ECOLOGY & SYSTEMATICS 113 (1995).
18. *See* OSTROM, *supra* note 4, at 88-102; Becker & Ostrom, *supra* note 17.
19. *See* OSTROM, *supra* note 4, at 36.
20. *See id.* at 90, tbl.3; *see also infra* app.1.
21. *See* OSTROM, *supra* note 4, at 90.
22. *See id.* at 6.
23. *See infra* app.1.
24. *See* OSTROM, *supra* note 4, at 90, 92; Becker & Ostrom, *supra* note 17, at 119.
25. *See infra* app.1.
26. *See id.*
27. *See* OSTROM, *supra* note 4, at 90, 94.
28. *See* ELINOR OSTROM, CRAFTING INSTITUTIONS FOR SELF-GOVERNING IRRIGATION SYSTEMS 74 (1992).
29. *See id.*
30. *See* Tomoya Akimichi, *Territorial Regulation in the Small-Scale Fisheries of Itoman, Okinawa, in* MARITIME INSTITUTIONS IN THE WESTERN PACIFIC 89, 98-106 (Senri Ethnological Studies No. 17, Kenneth Ruddle & Tomoya Akimichi eds., 1984).
31. *See* OSTROM, *supra* note 28, at 74.
32. *See* Kenneth Ruddle & Tomoya Akimichi, *Sea Tenure in Japan and the Southeastern Ryukyus, in* A SEA OF SMALL BOATS 337, 358-64 (Cultural Survival Report No. 26, John Cordell ed., 1989); Kevin M. Short, *Resource Management Under the Japanese Fishery Rights System: A Case Study from Hokkaido, in* A SEA OF SMALL BOATS, *supra*, at 371, 378.
33. *See infra* app.1.
34. *See* EVELYN PINKERTON & MARTIN WEINSTEIN, FISHERIES THAT WORK: SUSTAINABILITY THROUGH COMMUNITY-BASED MANAGEMENT (1995).
35. *See id.* at 12-14 (listing the different functions involved in fisheries management).
36. *See* OSTROM, *supra* note 4, at 88-102.
37. *See* Becker & Ostrom, *supra* note 17.
38. *See* OSTROM, *supra* note 4, at 102.
39. *See* TIM D. SMITH, SCALING FISHERIES: THE SCIENCE OF MEASURING THE EFFECTS OF FISHING 263-65 (1994).
40. *See id.*
41. *See id.* at 8-35.
42. *See id.* at 2, 237.
43. *See* Hardin, *supra* note 6.
44. *See, e.g.*, G. Alex Fraser, *Limited Entry: Experience of the British Columbia Salmon Fishery*, 36 J. FISHERIES RES. BD. CAN. 754 (1979).
45. *See* BERRILL, *supra* note 2, at 42 (describing the TAC as usually indicating "the most fish that can be harvested without reducing the size of next year's stock of reproducing individuals; it supposedly allows for sustainable fishing of the stock into the future.").
46. *See* PETER J. USHER, THE DEVOLUTION OF WILDLIFE MANAGEMENT AND THE PROSPECTS FOR WILDLIFE CONSERVATION IN THE NORTHWEST TERRITORIES (Canadian Arctic Resources Comm. Policy Paper No. 3, 1986).
47. *See id.*
48. *See* Marvin McInnis, *Canada in 1961: Isodemographic Canada, in* HISTORICAL ATLAS OF CANADA: ADDRESSING THE TWENTIETH CENTURY plate 66 (Donald Kerr & Deryck W. Holdsworth eds., 1990).

49. *See, e.g.*, R.G. MATSON & GARY COUPLAND, THE PREHISTORY OF THE NORTHWEST COAST (1995); THE EVOLUTION OF MARITIME CULTURES OF THE NORTHEAST AND NORTHWEST COASTS OF AMERICA (Simon Fraser Univ. Dep't of Anthropology Publication No. 11, Ronald J. Nash ed., 1983).
50. The principal sources for this understanding come from the northern regions of Canada and from Alaska. Since the 1970s there have been numerous "harvest surveys" in the Canadian north and Alaska. These studies document community harvests of fish, wildlife, and plants; typically documenting harvests over a one year period of time. In some instances, the surveys also include income from other sources (such as wage labor, commodity sales, transfer payments, business income, etc.) to compare the relative contribution of each of these sectors to the community's annual income. *See, e.g.*, MARTIN WEINSTEIN, WHAT THE LAND PROVIDES: AN EXAMINATION OF THE FORT GEORGE SUBSISTENCE ECONOMY AND THE POSSIBLE CONSEQUENCES ON IT OF THE JAMES BAY HYDROELECTRIC PROJECT (1976); Martin S. Weinstein, *The Ross River Dena: A Yukon Aboriginal Economy (Royal Comm. on Aboriginal Peoples' Aboriginal Econ. Case Studies), in* SEVEN GENERATIONS, REPORTS OF THE ROYAL COMMISSION ON ABORIGINAL PEOPLES (CD-ROM 1996).

The key methodological issues involved in these surveys were reviewed in PETER J. USHER ET AL., AN EVALUATION OF NATIVE HARVEST SURVEY METHODOLOGIES IN NORTHERN CANADA (Environmental Studies Revolving Fund Report No. 4, 1985); Peter J. Usher & George Wenzel, *Native Harvest Surveys and Statistics: A Critique of their Construction and Use*, 40 ARCTIC 145 (1987).

The Alaska Department of Fish and Game, Division of Subsistence, has conducted hundreds of subsistence surveys. One such survey reviewed the data about the subsistence-based economies of the coastal communities of southwest Alaska. *See* ROBERT J. WOLFE ET AL., SUBSISTENCE-BASED ECONOMICS IN COASTAL COMMUNITIES OF SOUTHWEST ALASKA (Alaska Dep't of Fish & Game Technical Paper No. 89, 1984).

Wolfe and Walker reviewed the results of the Alaskan surveys to the mid-1980s. *See* Robert J. Wolfe & Robert J. Walker, *Subsistence Economies in Alaska: Productivity, Geography and Development Impacts*, 24 ARCTIC ANTHROPOLOGY 56 (1987).

Significantly, such quantitatively detailed surveys are lacking for aboriginal and other communities in the coastal regions of Atlantic and Pacific Canada. However, an overview survey of these issues was done for a B.C. aboriginal fisheries organization, the Kwakiutl Territorial Fisheries Commission. *See* Martin S. Weinstein & Mike Morrell, Need is Not a Number: Report of the Kwakiutl Marine Food Fisheries Reconnaissance Survey (1994) (unpublished manuscript, on file with the Kwakiutl Territorial Fisheries Commission).

51. *See* R. v. Sparrow [1990] 1 S.C.R. 1075.
52. *See id.* at 1076-77. Although the *Sparrow* decision established the foundation for allocation, subsequent decisions have created a more complex regulatory environment. The current ruling (as of Nov. 17, 1999) is that the exercise of aboriginal and treaty rights can be limited by:

> other compelling and substantial public objectives which may include economic and regional fairness, and the recognition of the historical reliance upon, and participation in, the fishery by non-aboriginal groups . . . Aboriginal people are entitled to be consulted about limitations on the exercise of treaty and aboriginal rights . . . The Minister has available for regulatory purposes the full range of resource management tools and techniques, provided their use to limit the exercise of a treaty [or aboriginal] right can be justified on conservation or other grounds.

R. v. Marshall [1999] 4 C.N.L.R. 304.

53. *See* R. v. Van der Peet [1996] 2 S.C.R. 507; R. v. N.T.C. Smokehouse Ltd. [1996] 2 S.C.R. 672; R. v. Gladstone [1996] 2 S.C.R. 723.
54. *See, e.g., Van der Peet*, 2 S.C.R. at 507; *N.T.C. Smokehouse Ltd.*, 2 S.C.R. at 672; *Gladstone*, 2 S.C.R. at 723.
55. *See Van der Peet*, 2 S.C.R. at 509.
56. *See id.* at 515, 517.

57. The Heiltsuk, also known as the Bella Bella, live on the central coast of B.C. and are a part of the Wakashan language family/cultural group.
58. *See Gladstone*, 2 S.C.R. at 725.
59. The Nuxalk, also known as the Bella Coola, also live on the central coast of B.C. and are a part of the Salish language family/cultural group.
60. *See Marshall*, 4 C.N.L.R. at 304.
61. Treaty rights emerge from agreements between aboriginal parties and the Crown, and inherently deal with joint use (between aboriginal and non-aboriginal parties) of resources and land. By contrast, "an aboriginal right which in its origin, by definition, was *exclusively* exercised by aboriginal people prior to contact with Europeans." *Id.* para. 38.
62. *See, e.g.*, Kevin Cox, *Determining 'Fair Share' Complicated: Figuring Out Who Gets What in the Atlantic Fishery will be Time-Consuming and Costly*, THE GLOBE & MAIL, Oct. 8, 1999, at A7; John DeMont, *Lobster Wars*, MACLEAN'S, Oct. 11, 1999, at 20-21; Tu Thanh Ha, *Natives Defy Call to Stop Fishing*, THE GLOBE & MAIL, Oct. 8, 1999, at A1, A7.
63. *Sparrow*, 1 S.C.R. at 1078.
64. *See, e.g.*, R. v. Jack [1996] 131 D.L.R. 165; R. v. Sampson [1996] 131 D.L.R. 192; R. v Little [1996] 131 D.L.R. 220. That this includes the commercial, as well as the aboriginal, food fishing sector is apparent in *Gladstone*, 2 S.C.R. at 728-29.
65. *See* BERRILL, *supra* note 2, at 1-11.

> The picture is grim everywhere you look. Canada has closed down the cod fisheries on the Grand Banks and much of the salmon fishery in southern British Columbia, and the United States has closed most of the ground fishing on Georges Bank and has declared the salmon-fishing region of Washington and Oregon a disaster area. Larger, more valuable species such as cod and halibut have become increasingly rare, while smaller, more abundant but less valuable species of the herring family replace them on the most-hunted lists. Paradoxically, even though the world catch of all species has stopped growing, the size and number of fleets searching for fish have continued to expand.

Id. at 2.

66. *See* CARL WALTERS, FISH ON THE LINE: THE FUTURE OF PACIFIC FISHERIES 3, 9 (1995).
67. *See, e.g.*, Mike Morrell, *The Struggle to Integrate Traditional Indian Systems and State Management in the Salmon Fisheries of the Skeena River, British Columbia, in* CO-OPERATIVE MANAGEMENT OF LOCAL FISHERIES, *supra* note 4, at 231 [hereinafter Morrell 1989]; Mike Morrell, The Gitksan and Wet'suwet'en Fishery in the Skeena River System: Final Report (1985) (unpublished manuscript, on file with the Gitksan-Wet'suwet'en Tribal Council, Hazelton, B.C., Can.) [hereinafter Morrell 1985]; Martin Weinstein, The Role of Tenure and the Potlatch in Fisheries Management by Northwest Pacific Coast Aboriginal Societies (1994) (unpublished manuscript, on file with author) [hereinafter Weinstein 1994]; Martin Weinstein, Nimpkish Valley: A History of Resource Management on the Vancouver Island Lands of the Nimpkish Indian People from Aboriginal Times to the 1980s (1991) (unpublished manuscript, on file with the Namgis Band Council, Alert Bay, B.C., Can.) [hereinafter Weinstein 1991]; Martin Weinstein, Traditional Nisga'a Fisheries Management (1985) (unpublished manuscript, on file with the Nisgha Tribal Council, New Aiyansh, B.C., Can.) [hereinafter Weinstein 1985]; Weinstein & Morrell, *supra* note 50.
68. *See* DIANNE NEWELL, TANGLED WEBS OF HISTORY: INDIANS AND THE LAW IN CANADA'S PACIFIC COAST FISHERIES 28 (1993).
69. *See, e.g.*, *Gladstone*, 2 S.C.R. at 725. *See also* Wilson Duff, The Southern Kwakiutl (1965) (unpublished manuscript, on file at the British Columbia Provincial Museum) (discussing the trade of sun-dried halibut for processed eulachon by Kwakiutl groups who lacked the right to fish for eulachon with those tribes).

70. *See* Robert T. Boyd, *Demographic History, 1774-1874, in* HANDBOOK OF NORTH AMERICAN INDIANS: NORTHWEST COAST (Wayne Suttles ed., 1990);Brian S. Chisholm et al., *Marine and Terrestrial Protein in Prehistoric Diets on the British Columbia Coast*, 24 CURRENT ANTHROPOLOGY 396, 397 (1983); Gordon W. Hewes, *Indian Fisheries Productivity in Pre-Contact Times in the Pacific Salmon Area*, 7 N.W. ANTHROPOLOGICAL RES. NOTES 133 (1973); Randall F. Schalk, *Estimating Salmon and Steelhead Usage in the Columbia Basin Before 1850: The Anthropological Perspective*, 2 N.W. ENVTL. J. 1 (1986).
71. *See* Hewes, *supra* note 70; D. W. Chapman, *Salmon and Steelhead Abundance in the Columbia River in the Nineteenth Century*, 115 TRANS. AM. FISH. SOC. 662 (1986); Mike Morrell, A Simple Model of the Pre-Contact Salmon Fishery of the Skeena River System (1987) (unpublished manuscript, on file with Gitksan-Wet'suwet'en Tribal Council, Hazelton, B.C., Can.).
72. *See* Wayne Suttles, *Coping with Abundance: Subsistence on the Northwest Coast, in* MAN THE HUNTER 56 (Richard B. Lee & Irven DeVore eds., 1968).
73. *See, e.g.*, Morrell 1989, *supra* note 67; Morrell 1985, *supra* note 67; Weinstein 1994, *supra* note 67; Weinstein 1991, *supra* note 67; Weinstein 1985, *supra* note 67; Weinstein & Morrell, *supra* note 50. *See also* NEWELL, *supra* note 68, at 40-45.
74. *See* discussion *infra* Part III.A.2.a.
75. *See* Martin S. Weinstein, *Sharing Information or Captured Heritage: Access to Community Geographic Knowledge and the State's Responsibility to Protect Aboriginal Rights in British Columbia* (June 14, 1998) <http://www.nativemaps.org/StoriesNewsReviews/Reviews/abstracts/Weinstein1.html >.
76. *See* Franz Boas, *First General Report on the Indians of British Columbia, in* REPORT OF THE FIFTY-NINTH MEETING OF THE BRITISH ASS'N FOR THE ADVANCEMENT OF SCIENCE 833-34 (1890).

> Among all the tribes heretofore described each gens [kinship group] owns a certain district and certain fishing privileges. Among the Tlingit, Haida, and Tsimpshian each gens in each village has its own fishing ground; its mountains and valleys, on which it has the sole right of hunting and picking berries; its rivers in which to fish salmon, and its house sites . . . The Kwakiutl . . . have the same distribution of land among the various gentes . . . [as do the other Indian groups].

Id.

77. *See* Duff, *supra* note 69, at 3-5.
78. *See id.* at 4-5; *see also* ROBERT GALOIS, KWAKWAKA'WAKW SETTLEMENTS, 1775-1920: A GEOGRAPHIC ANALYSIS AND GAZETTEER 22-27 (1994).
79. *See, e.g.*, Weinstein 1994, *supra* note 67.
80. *See, e.g.*, Morrell 1989, *supra* note 67; Morrell 1985, *supra* note 67; Weinstein 1985, *supra* note 67.
81. *See, e.g.*, Morrell 1989, *supra* note 67; Morrell 1985, *supra* note 67; Weinstein 1985, *supra* note 67.
82. *See* Marjorie M. Halpin & Margaret Seguin, *Southern Tsimshian Peoples: Tsimshian, Coast Tsimshian, Nishga, and Gitksan, in* HANDBOOK OF NORTH AMERICAN INDIANS, *supra* note 70, at 267.
83. *See id.* at 274, 276.
84. *See* Morrell 1985, *supra* note 67, at 6-7, 28-32; Weinstein 1985, *supra* note 67, at 2-3.
85. The same system operated for the Coast Tsimshian, who belong to the same language and cultural grouping. *See* Interview with Sandra Littlewood, Researcher for the Metlakatla Language, Culture, and Heritage Comm., in Prince Rupert, B.C. (1998). Metlakatla is a Coast Tsimshian community, close to the city of Prince Rupert, on the northern coast of B.C. The Metlakatla Language, Culture, and Heritage Committee is a community organization charged with the research and development of the lands and sea areas traditionally occupied by the Coast Tsimshian of Metlakatla.
86. *See* Morrell 1985, *supra* note 67, at 6-7, 28-32; Weinstein 1985, *supra* note 67, at 3.
87. *See* Morrell 1985, *supra* note 67, at 28-32; Weinstein 1985, *supra* note 67, at 3.
88. *See* Morrell 1985, *supra* note 67, at 24-28; Weinstein 1985, *supra* note 67, at 6.
89. *See* ALLENE DRAKE & LYLE WILSON, EULACHON: A FISH TO CURE HUMANITY 29-33 (University of British Columbia Museum of Anthropology Note No. 32, 1992).

90. *See* Morrell 1985, *supra* note 67, at 29-30; Weinstein 1985, *supra* note 67, at 4.
91. *See* Weinstein 1985, *supra* note 67, at 5.
92. This is called the *yuuku* or settlement feast in Nisga'a and Gitkan tradition. The potlatch, or feasting, tradition was a ceremonial practice followed, in differing ways, by most Pacific Northwest Coast societies. Although potlatches had differing meanings among the different groups, the common feature was formal gift-giving by the tribal elite to validate their position within aboriginal society. *See, e.g.*, Wayne Suttles, *Introduction* to HANDBOOK OF NORTH AMERICAN INDIANS, *supra* note 70, at 4.
93. *See* Weinstein 1985, *supra* note 67, at 7.
94. *See, e.g.*, Helen Codere, *Kwakiutl: Traditional Culture, in* HANDBOOK OF NORTH AMERICAN INDIANS, *supra* note 70, at 359.
95. Our understandings of the Kwakiutl system of resource and fisheries management are both more limited and more detailed than our understanding of the Nisga'a and Gitksan system. The Kwakiutl have an enormous anthropological literature, due mostly to the work of Franz Boas and George Hunt during the turn of the twentieth century. Economic and resource management issues were not a direct focus of their work, but critical insights are available from some detailed analyses of later anthropologists. *See, e.g.*, Helen Codere, *Fighting with Property: A Study of Kwakiutl Potlatching and Warfare: 1792-1930, in* 18 MONOGRAPHS OF THE AMERICAN ETHNOLOGICAL SOCIETY (1950); Stuart Piddocke, *The Potlatch System of the Southern Kwakiutl: A New Perspective*, 21 S.W. J. ANTHROPOLOGY 244 (1965).
96. *See* Duff, *supra* note 69, at 4-5; Piddocke, *supra* note 95.
97. *See* Duff, *supra* note 69, at 4-6.
98. *See* FRANZ BOAS, GEOGRAPHICAL NAMES OF THE KWAKIUTL INDIANS 20 (1934).
99. *See* Duff, *supra* note 69, at 4-5; Martin Weinstein, Traditional Kwakiutl Government: A Background Report for Discussions about Kwakiutl Self-Government 47-56 (1987) (unpublished manuscript, on file with the author).
100. *See* Piddocke, *supra* note 95, at 138; *see also* Franz Boas, *Ethnology of the Kwakiutl, in* THIRTY-FIFTH ANNUAL REPORT OF THE BUREAU OF AMERICAN ETHNOLOGY 1333-35, 1337-38 (1921).
101. *See, e.g.*, Codere, *supra* note 95, at 63; *see also* PHILIP DRUCKER & ROBERT F. HEIZER, TO MAKE MY NAME GOOD: A REEXAMINATION OF THE SOUTHERN KWAKIUTL POTLATCH 8 (1967); ABRAHAM ROSMAN & PAULA G. RUBEL, FEASTING WITH MINE ENEMY: RANK AND EXCHANGE AMONG NORTHWEST COAST SOCIETIES 157-58 (1971).
102. *See* Codere 1950, *supra* note 95, at 91-96.
103. *See id.*
104. *See* DRUCKER & HEIZER, *supra* note 101, at 42-43, 133.
105. *See* Eugene E. Ruyle, *Slavery, Surplus, and Stratification on the Northwest Coast: The Ethnoenergetics of an Incipient Stratification System*, 14 CURRENT ANTHROPOLOGY 603, 614-16 (1973).
106. *See* DRUCKER & HEIZER, *supra* note 101, at 122, 132-33.
107. *See* Ruyle, *supra* note 105, at 614.
108. *See* DRAKE & WILSON, *supra* note 89.
109. *See* NEWELL, *supra* note 68, at 40.
110. *See* THE QUESTION OF THE COMMONS, *supra* note 12, at 6-7, 10-11.
111. *See, e.g.*, ROBERT E. CAIL, LAND, MAN, AND THE LAW: THE DISPOSAL OF CROWN LANDS IN BRITISH COLUMBIA (1974).
112. *See id.*
113. *See* Keith E. Casey et al., *The Effects of Individual Vessel Quotas in the British Columbia Halibut Fishery*, 10 MARINE RESOURCE ECON. 212 (1995).
114. *See* Philip A. Neher, *Fishery Management in Canada, in* MANAGING FISHERY RESOURCES 22 (World Bank Discussion Papers Fisheries Series No. 217, Eduardo A. Loayza ed., 1994).
115. *See* Peter J. Usher et al., *Reclaiming the Land: Aboriginal Title, Treaty Rights, and Land Claims in Canada*, 12 APPLIED GEOGRAPHY 109, 111-12 (1992).
116. *See id.* at 112.

117. *See id.* at 112-13.
118. *See* Yoshiaki Matsuda, *The Japanese "Type 1 Common Fishery Right": Evolution and Current Management Problems*, 8 RESOURCE MGMT. & OPTIMIZATION 216 (1991).
119. *See* Fikret Berkes & M. Taghi Farvar, *Introduction to* COMMON PROPERTY RESOURCES, *supra* note 12, at 9-10; PINKERTON & WEINSTEIN, *supra* note 34, at 9-11.
120. *See, e.g.*, MARITIME INSTITUTIONS IN THE WESTERN PACIFIC, *supra* note 30; A SEA OF SMALL BOATS, *supra* note 32; THE TRADITIONAL KNOWLEDGE AND MANAGEMENT OF COASTAL SYSTEMS IN ASIA AND THE PACIFIC (Kenneth Ruddle & R.E. Johannes eds., 1985); Usher et al., *supra* note 115, at 112.
121. *See* PINKERTON & WEINSTEIN, *supra* note 34, at 16-18. *See also infra* app.1.
122. *See* CAIL, *supra* note 111.
123. *See id.* at 71-72, 91-92.
124. *See, e.g., id.*; PETER H. PEARSE, TIMBER RIGHTS AND FOREST POLICY IN BRITISH COLUMBIA (1976). See also Weinstein 1991, *supra* note 67, at 83-87 for a historical example how the forest tenure policy operated on Vancouver Island.
125. *See* CAIL, *supra* note 111, at 98-104.
126. *See id.* at 104.
127. *See* HUGH BRODY, MAPS AND DREAMS: INDIANS AND THE BRITISH COLUMBIA FRONTIER 88-89 (1981).
128. *See infra* app.2.
129. Indeed, it appears that the creation of very small waterfront reserves for B.C. coastal Indians during the turn-of-the-twentieth-century was justified by the access they provided to an enormously abundant common property marine resource. *See* NEWELL, *supra* note 68, at 55-57.
130. *See* Fraser, *supra* note 44, at 755.
131. *See id.*; *see also* NEWELL, *supra* note 68, at 128-29; Weinstein & Morrell, *supra* note 50, at 78-79.
132. *See* Fraser, *supra* note 44, at 756.
133. *See* Canadian Department of Fisheries and Oceans, *The Pacific Salmon Revitalization Strategy* (Jan. 1997) <http://www.ncr.dfo.ca/communic/backgrou/1997/hq3eb3.htm>.

> On March 29, 1996, Fred Mifflin, Minister of Fisheries and Oceans, announced a comprehensive strategy to revitalize the west coast commercial salmon fisher . . . [Among] the main elements of the Pacific Salmon Revitalization Strategy [is] a 50 per cent reduction in the commercial salmon fleet over several years. To start the process of capacity reduction, an $80 million voluntary license retirement program was offered in 1996, under which 800 licenses were retired, and a new approach to licensing that divides the coast in two areas for seiners and three for gillnetters and trollers. License holders are given the choice to fish one of these areas, using one type of gear. If the license holder wishes to fish in more than one area or with more than one type of gear, additional licenses must be obtained from another license-holder. These measures introduced a market mechanism—license stacking—to promote fleet rationalization. (License stacking was frozen after June 30, 1996 until January 15, 1997 to prevent in-season stacking and to await the review of the Strategy by the tripartite panel).

Id.

134. *See* NEWELL, *supra* note 68, at 150-53; Fraser, *supra* note 44.
135. *See* NEWELL, *supra* note 68, at 150-53; Fraser, *supra* note 44.
136. *See* Weinstein & Morrell, *supra* note 50, at 80-81.
137. *See* Fraser, *supra* note 44, at 758-59.
138. *See* A. Brian Peckford, *Reaching Out: Final Report of the Peckford Inquiry* (Nov. 1998) <http://www.fisheries.gov.bc.ca/Publications/Peckford_final.htm>.
139. *See* Hardin, *supra* note 6.
140. *See, e.g.*, ANTHONY SCOTT & MAURICE TUGWELL, THE PUBLIC REGULATION OF COMMERCIAL FISHERIES IN CANADA 41 (Economic Council of Can. Technical Report No. 16, 1981).

141. *See* Casey et al., *supra* note 113, at 216, 226, 228-29.
142. *See, e.g.*, M. PATRICIA MARCHAK, LOGGING THE GLOBE 101-04 (1995) (listing of the foreign ownership of forest companies in B.C.). Since the publication of this book, some significant changes have taken place. The most important of these was the sale of MacMillan Bloedel, one of the primary Canadian-owned integrated forestry companies in B.C., to American owned Weyerhaeuser, "the largest private timber owner in the world." *Id.* at 103.
143. BRITISH COLUMBIA ENVTL. ASSESSMENT OFFICE, SALMON AQUACULTURE REVIEW: SUMMARY 2 (1997). Tenures consist of 10-year licenses or 30-year leases. *See id.*
144. *See* BRITISH COLUMBIA MINISTRY OF FISHERIES, THE 1997 BRITISH COLUMBIA SEAFOOD INDUSTRY YEAR IN REVIEW 3 (1998).
145. *See id.*
146. *See, e.g.*, DAVID W. ELLIS ET AL., NET LOSS: THE SALMON NETCAGE INDUSTRY IN BRITISH COLUMBIA (1996); BRITISH COLUMBIA ENVTL. ASSESSMENT OFFICE, *supra* note 143; Carl Folke et al., *The Costs of Eutrophication from Salmon Farming: Implications for Policy*, 40 J. ENVTL. MGMT. 173 (1994); Lynn Hunter, *Salmon Disaster Risk Real*, VICTORIA TIMES COLONIST, Apr. 30, 1998.
147. The B.C. government responded to these concerns with a new aquaculture policy released in the fall of 1999. Under the new policy, the number of salmon aquaculture tenures were capped at 121 and new measures are required to prevent escapes. The policy also encouraged experiments with totally-enclosed salmon farming operations. *See, e.g.*, Sarah Schmidt, *Fish and Chips*, THE GLOBE & MAIL, Nov. 18, 1999, at T1, T3.
148. *See* BRITISH COLUMBIA AQUACULTURE & COMMERCIAL FISHERIES BRANCH, AQUACULTURE AND COMMERCIAL FISHERIES BULLETIN: THE LICENSING OF AQUACULTURE IN BRITISH COLUMBIA (1997). "A License of Occupation or Lease may be assigned or transferred to another party, but only after it has been brought to a satisfactory state of development." *Id.*
149. *See, e.g.*, PINKERTON & WEINSTEIN, *supra* note 34, at 99.
150. *See* GEORGE MACAULEY TREVELYAN, ENGLISH SOCIAL HISTORY 391, 550 (1967).
151. *See id.* at 390, 395.
152. *See* OSTROM, *supra* note 4, at 88-102.
153. *See* PINKERTON & WEINSTEIN, *supra* note 34, at 71, 88-91.
154. This discussion is based on a more detailed description of fisheries management by Japanese Cooperative Associations that appears in PINKERTON & WEINSTEIN, *supra* note 34, at 71-98.
155. *See* Kenneth Ruddle, *Solving the Common-Property Dilemma: Village Fisheries Rights in Japanese Coastal Waters, in* COMMON PROPERTY RESOURCES, *supra* note 12, at 169-71; Tadashi Yamamoto, *Development of a Community-Based Fishery Management System in Japan*, 10 MARINE RESOURCE ECON. 21, 24 (1995).
156. *See, e.g.*, BERRILL, *supra* note 2, at 125, 137.
157. *See* Convention on the Law of the Sea, Dec. 10, 1982, pt. V, 1833 U.N.T.S. 3, 418-28 (establishing exclusive economic zones).
158. *See* Tomoya Akimichi & Kenneth Ruddle, *The Historical Development of Territorial Rights and Fishery Regulations in Okinawan Inshore Waters, in* MARITIME INSTITUTIONS, *supra* note 30, at 37; ARNE KALLAND, FISHING VILLAGES IN TOKUGAWA JAPAN (1995); KENNETH RUDDLE, ADMINISTRATION AND CONFLICT MANAGEMENT IN JAPANESE COASTAL FISHERIES (FAO Fisheries Technical Paper No. 273, 1987).
159. *See* Yukiko Kada, *The Evolution of Joint Fisheries Rights and Village Community Structure on Lake Biwa, Japan, in* MARITIME INSTITUTIONS, *supra* note 30, at 137.
160. *See, e.g.*, RICHARD STOREY, A HISTORY OF MODERN JAPAN 103 (1973). For a discussion about the influence of European law on the early modern development of Japanese law see YOSHIYUKI NODA, INTRODUCTION TO JAPANESE LAW 42-45 (Anthony H. Angelo trans., University of Tokyo Press 1976).
161. "A special fishery mission dispatched to Europe found fishery laws in France, Germany, and England." Yamamoto, *supra* note 155, at 24.
162. *See* Kenneth Ruddle, *The Continuity of Traditional Management Practices: The Case of Japanese Coastal Fisheries, in* THE TRADITIONAL KNOWLEDGE AND MANAGEMENT OF COASTAL SYSTEMS IN ASIA AND THE PACIFIC, *supra* note 120, at 167-68.

163. *See* Ruddle & Akimichi, *supra* note 32, at 343; Masaaki Sato, *Fisheries Cooperatives in Japan as Fisheries Management Organization, in* INTERNATIONAL PERSPECTIVES ON FISHERIES MANAGEMENT 74 (Tadashi Yamamoto & Kevin Short eds., 1992).
164. *See* Sato, *supra* note 163.
165. *See* RUDDLE, *supra* note 158, at 24. On opening access to the coastal fishery,

> a free-for-all ensued as new entries into coastal fisheries increased vastly, since agriculturists clamoured for entry and a widespread effort to develop commercial fisheries arose. This led to the common occurrence of disputes over access and traditional rights among hitherto exclusively farming and exclusively fishing villages. And the highly capitalized big operator, generally a rich village merchant, bettered his position against the small-scale fisherman.

RUDDLE, *supra* note 158, at 24.
The opening of the fisheries

> led to outbreaks of disputes, quarrels and conflicts among the applicants (fishermen), competing for larger shares of better and wider fishing grounds all over the country. The confusion became uncontrollable, and the cabinet order was abolished in 1876.

Sato, *supra* note 163, at 75.
166. *See* Sato, *supra* note 163.
167. *See* Ruddle & Akimichi, *supra* note 32, at 343; Matsuda, *supra* note 118, at 216.
168. Ruddle & Akimichi, *supra* note 32, at 344.
169. *See id.*
170. *See id.*
171. *See id.*
172. *See id.*; Yamamoto, *supra* note 155, at 22, 24-25.
173. Yamamoto, *supra* note 155, at 24.
174. *See id.* at 156; Ruddle & Akimichi, *supra* note 32, at 344.
175. *See* Ruddle & Akimichi, *supra* note 32, at 344; Yamamoto, *supra* note 155, at 24.
176. *See* Sato, *supra* note 163, at 78; Ruddle & Akimichi, *supra* note 32, at 344.
177. *See* RUDDLE, *supra* note 158, at 47-48; Yamamoto, *supra* note 155, at 25.
178. Two new laws were created, which provide the basis for the modern fishery in Japan. *See* The Fisheries Co-Operative Association Law, Law No. 242 of 1948 (current version at Law No. 58 of 1973); The Fisheries Law, Law No. 267 of 1949 (current version at Law No. 63 of 1975).
179. *See* Ruddle & Akimichi, *supra* note 32, at 345.
180. *See id.* at 353.
181. *See* Yutaka Hirasawa et al., *Fisheries Cooperative as the Core for Development of Coastal Fisheries Management System—Japanese Experience, in* INTERNATIONAL PERSPECTIVES, *supra* note 163, at 131-35.
182. *See id.* at 127-58.
183. *See infra* app.3.
184. *See id.*
185. *See* RUDDLE, *supra* note 158, at 36-39; Tadashi Yamamoto, Legal Nature of Japanese Fishing Right and License System (1996) (unpublished manuscript, on file with author) [hereinafter Yamamoto, Legal Nature of Japanese Fishing Right]; Tadashi Yamamoto, *Fundamental Difference in Fisheries Management between Japan and the Western Countries, in* OCCASIONAL PAPER OF THE REGIONAL FISHERIES SOCIETY 74-77 (1996) [hereinafter Yamamoto, *Fundamental Difference in Fisheries Management*].
186. *See* Yamamoto, *Fundamental Difference in Fisheries Management*, *supra* note 185, at 68.
187. *See id.*
188. *See id.*

189. *See* Kevin M. Short, *The Japanese Coastal Fisheries Management System Based on Exclusive Fishing Rights, in* INTERNATIONAL PERSPECTIVES ON FISHERIES MANAGEMENT, *supra* note 163, at 43 [hereinafter Short 1992]; Short, *supra* note 32; Yamamoto, *supra* note 155, at 27.
190. *See* Yamamoto, *supra* note 155, at 32-33.
191. *See id.*
192. *See id.*
193. *See id.*
194. *See id.*
195. *See, e.g., The Red Sea Bream Market,* 33 YAMAHA FISHERY J. 8 (1990).
196. *See* Short 1992, *supra* note 189, at 49, 56-57.
197. *See* discussion *supra* Part II. *See also infra* app.1.
198. *See* BERRILL, *supra* note 2, at 56-61.
199. *See, e.g.,* Akimichi, *supra* note 30; Taku Iida, *Competition and Communal Regulation in the Kombu Kelp (Laminaria angustata) Harvest,* 26 HUMAN ECOLOGY 418, 418-21 (1998); MARITIME INSTITUTIONS, *supra* note 30; Ruddle, *supra* note 155; Short 1992, *supra* note 189; Short, *supra* note 32.
200. *See* Short, *supra* note 32, at 377-82.
201. *See id.*
202. *See id.*
203. *See id.*
204. *See Fishery Cooperative Association Activities That Bring out the Enterprising Spirit in Fishermen,* 29 YAMAHA FISHERY J. 8 (1989).
205. *See id.*
206. *See* Akira Hasegawa et al., *An Overview of Japanese Fisheries Management Systems Developed under the Initiative of Fishermen: The Results of the 1988 Fishery Census, in* INTERNATIONAL PERSPECTIVES ON FISHERIES MANAGEMENT, *supra* note 163, at 103.
207. *See, e.g., Fishery Cooperative Association Activities, supra* note 204.
208. *See* Kären Wigen, *Shifting Control in Japan's Coastal Waters, in* A SEA OF SMALL BOATS, *supra* note 32, at 388.
209. *See* RUDDLE, *supra* note 158, at 3-88; Harumi Befu, *Political Ecology of Fishing in Japan: Techno-Environmental Impact of Industrialization in the Inland Sea,* 3 RES. ECON. ANTHROPOLOGY 323 (1980).
210. *See* RUDDLE, *supra* note 158, at 76-84; Short 1992, *supra* note 189, at 62-63.
211. For example, the annual production of the coastal capture fishery—the domain of the FCAs—during the period 1975-1989 was moderately stable, at about two million metric tons, representing 18.7% of the total Japanese fisheries production in 1975 and 18.1% in 1989. In the coastal aquaculture sector—another part of the FCAs' domain—production represented 9.1% of the total in 1975 and had increased to 10.9% in 1989.

The significance of these fisheries becomes more apparent when looking at their combined share of the overall fishery value. In 1989, the coastal capture fishery was responsible for 31.2% (about 750 billion yen) of the total annual value of all Japanese fisheries and the coastal aquaculture sector was responsible for another 22.5% (about 600 billion yen). *See* Tadashi Yamamoto, *Japanese Fisheries: Current Status and Issues, in* INTERNATIONAL PERSPECTIVES ON FISHERIES MANAGEMENT, *supra* note 163, at 12-13.
212. *See id.* at 14-15; Short 1992, *supra* note 189, at 44-45.
213. *See* Gene Barrett & Tadashi Okudaira, *The Limits of Fishery Cooperatives? Community Development and Rural Depopulation in Hokkaido, Japan,* 16 ECON. & INDUS. DEMOCRACY 201 (1995).
214. *See* Yamamoto, *supra* note 211, at 10-14.
215. *See* PINKERTON & WEINSTEIN, *supra* note 34, at 71.
216. *See* discussion *supra* Part II.
217. *See* PINKERTON & WEINSTEIN, *supra* note 34, at 2-9.
218. *Id.*
219. *Id.*

220. OSTROM, *supra* note 4. Defined boundaries link benefits to the quality of specific habitat areas. This creates incentives for users to invest time and money in monitoring. The design principles also include a number of conditions through which the collected information can be used, both internally (among the membership) and externally (in the larger community). *See id.*
221. *See* BRITISH COLUMBIA MINISTRY OF FISHERIES, *supra* note 144.
222. *See* WALTERS, *supra* note 66, at 5, 9-13; Carl J. Walters & Peter Cahoon, *Evidence for Decreasing Spatial Diversity in British Columbia Salmon Stocks*, 42 CANADIAN J. FISHERIES & AQUATIC SCI. 1033 (1985).
223. "First Nation" is a commonly used term in Canada to refer to the aboriginal groups formerly referred to as *Indians*. *See, e.g.*, REPORT OF THE ROYAL COMM'N ON ABORIGINAL PEOPLES: LOOKING FORWARD, LOOKING BACK xiv-xv (1996). The use of the term is equivalent to the word "tribes" in the United States. The term originated in response to the lack of recognition to aboriginal peoples when referring to the two founding nations of Canada, the English and the French. Problems in terminology still remain because the two other Canadian aboriginal groups, the Inuit and the Metis, tend to be referred to by their own collective names. *Aboriginal peoples* is the preferred collective term for all Canadian aboriginal groups.
224. *See, e.g.*, Weinstein & Morrell, *supra* note 50.
225. *See, e.g.*, Weinstein 1991, *supra* note 67, at 187-213.
226. *See* discussion *supra* Part III.B.1.
227. *See* Coastal Community Network, *Effects of the "Mifflin Plan" on Coastal Communities* (June 19, 1996) <http://www.coastalcommunity.bc.ca/html/reports/report1.htm>.

> [The Mifflin plan] concentrates ownership of the fleet into one-third of the present size and increases the capital value of the remaining vessels. That, in turn, increases the incentives or pressure for each vessel to increase its harvest rate to remain viable. The industry impact of the Mifflin Plan is as follows:
> The system of area-stackable licensing will force fishers to buy more licenses in order to stay afloat. That will drive the industry into the hands of those with the most capital, the large fishing-industry companies and wealthy multi-licence holders based in urban areas.
>
> Control of the fishery will become increasingly concentrated in the hands of even fewer fishers. Greater private control over our common resource is a trend that deeply troubles coastal communities.
>
> The harshest reductions in the fleet will fall on the small-boat fleet, especially troll-gillnet combination boats. The effect of the Mifflin Plan will be to increase the proportion of the total fleet made up of seine vessels.
>
> [. . .]
>
> [With regard to community impacts, the fisheries department has done absolutely no assessment of how its plan will affect the urban-based versus community-based fleet and native versus non-native communities. Because the Mifflin plan will lead to greater concentration of ownership of fishing vessels and licences, the continued urbanization of the fishing fleet will occur. This trend is especially troubling because of the limited employment opportunities in the small native and non-native coastal communities.
>
> *Id.*

228. *See* Sparrow 1 S.C.R. at 1078.

> [Aboriginal food, social and ceremonial] fishing rights are not traditional property rights. They are rights held by a collective and are in keeping with the culture and existence of that group. Courts must be careful to avoid the application of traditional common law concepts of property as they develop their understanding of the "sui generis" nature of the aboriginal rights. While it is impossible to give an easy definition of fishing rights, it is crucial to be sensitive to the aboriginal perspective on the meaning of the rights at stake.
>
> [. . .]
>
> We acknowledge the fact that the justificatory standard to be met may place a heavy burden on the Crown. However, government policy with respect to the British Columbia fishery, regardless of s.35(1) [of the Constitution of Canada], already dictates that, in allocating the right to take fish, Indian food fishing is to be given priority over the interests of other user groups. The constitutional entitlement embodied in s.35(1) requires the Crown to ensure that its regulations are in keeping with that allocation priority. The objective of this requirement is not to undermine Parliament's ability and responsibility with respect to creating and administering overall conservation and management plans regarding the salmon fishery. The objective is rather to guarantee that those plans treat aboriginal peoples in a way ensuring that their rights are taken seriously.

Id. at 1079.

229. That this includes the commercial as well as the aboriginal food fishing sector is shown in the Supreme Court of Canada's ruling in *Gladstone* 2 S.C.R. at 723. In describing how to balance communal and individual interests, the Court specifies that any interference with an aboriginal right must be in accord with the priority schedule established in *Sparrow*, of aboriginal rights following conservation needs. However, with regard to allocation between different sectors of the fishery, the Court recognized a difference between the food fishery and the commercial fishery. In a sense, the food fishery is self-regulating. There is a finite need for food within any given population. Commercial harvests provide livelihoods, but given abundance and effort, they also can generate wealth beyond family need for a livelihood. *Gladstone*'s directives about allocation include considerations of "the pursuit of economic and regional fairness, and the recognition of historical reliance upon, and participation in, the fishery by non-Aboriginal groups" as playing a role in tempering an absolute priority of the aboriginal right in the case of commercial resource rights. *Id.* at 731. These decisions obviously open up very complex questions about the regulation of such fisheries. In these cases, establishing rights-based community fisheries, such as that of the Japanese, might be a simplifying alternative to an increasingly complex issue.

230 *See* OSTROM, *supra* note 4; Becker & Ostrom, *supra* note 17.

231 *See* PINKERTON & WEINSTEIN, *supra* note 34, at 17.

232 *See* RUDDLE, *supra* note 158, at 36-9; Yamamoto, *Fundamental Difference in Fisheries Management*, *supra* note 185; Yamamoto, Legal Nature of Japanese Fishing Right, *supra* note 185.

FOREWORD TO THE PUBLIC FORUM

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Good evening to all of you, to the panellists that are here this evening, to the minister, and to my cousin, who is the hereditary chief of this territory, Chief Andy Thomas.

I want, first of all, to try to explain to you what the coastal zone of British Columbia means to First Nations, the Coast Salish tribes. We go back in history a few days. Our territory, that we managed for centuries, starts with our language. If you can't say a place or name a place, it doesn't belong to you; it belongs to someone else. So there were boundaries, and before those boundaries went in, we too, like other human beings in the world, had our wars and had our differences. But when those wars were over and boundaries established, we went about our business, and our differences and relationships with other tribes were settled.

Our boundary for the Coast Salish tribes is just east of Pach-y-nit, Port Renfrew, crossing over the Island to Comox. Comox is a Coast Salish word; it's pronounced Quo-o-mox, which means "head cut off." It crosses over the straits up to Powell River, up to the Snow Mountains, going east all the way to the Fraser Canyon. It crosses over to the United States, through Lummi, through Bellingham tribes, the Snohomish, Puyallup, Chehalem (which is Olympia), over to Clallum and just north of the Oregon border. This was the territory of the Coast Salish tribes, covering just under 500,000 square kilometres. This is the land that we managed and looked after for centuries upon centuries. The reason I say this to you is because we do have the experience, and we have the knowledge about the land. I was raised by an old woman, my great-grandmother. She was almost 120 when she died. She spoke no English; I never spoke English until I was just about seven years old. I went to school, in an Indian school—I never went to residential school—and I ended up in Victoria and St. Louis College.

But I want to tell you what happened to us when we lost the power to run and manage the resources of our land, some 400-and-some-odd-thousand square kilometres. Two years ago I wrote a letter to the newspaper, because we were having a lot of trouble with Federal Fisheries. We've always been at odds with both levels of government because of the way we have been treated over the last hundred years or so. But when Fisheries came to use some two or three years ago, they said to one of our villages, "This year you're only allowed 200 fish" for a tribe of 110. So I tried to figure that out. How much is that fish? How much *per capita* and what does it break down to in pounds? And I hope there's somebody writing this down out there, because what it came down to at the end for that year, the amount of fish we were allowed for our community, came down to 0.002 ounces per day. That's what we were supposed to live on for the year. This year, I have two children at home with me, a son and a daughter, and my wife. We were given 16 sockeye this year. That's for the four of us to live on for the whole year, because for some reason or other, the fish disappeared and there's no fish no more.

Our traditional territory had hundreds and thousands of deer, elk—every creature and animal. There were millions of them. Three years ago, my son and I got stopped for hunting. We wrote a letter to the minister responsible. We got two elk and eight deer and they took our elk away. That was to last us the whole year, and they confiscated it. They even told me they were going to take my truck away from me. I said, " Well, you go ahead and try." We became at odds with one another in words.

We have never been at peace with one another in the management of this province as far as First Nations people go. It's been a terrifying nightmare that a lot of you don't know about. For those of us that get threatened with guns and get threatened with intimidation… " If you don't do this, something else will

happen to you." You know, our people have adapted so many times over the last century or more, and we have not yet been able to live up to the expectations of the new society that has come onto our land. What happens when you lose the management of your coastal zone and the land that you once managed? Let me give you a very small example. In the community I come from, just outside Victoria—the Tsartlip Reserves, some 400 acres of land—over 90% of our people live on welfare. Those people that live on welfare, a family of two lives on $3,600 a year. And then we're regulated by Fisheries; we're regulated by the *Indian Act*; we're regulated by the *Wildlife Act*. Every act that has ever existed regulates us. So how do we manage? How do we talk to you about managing the land we once knew— almost 500,000 square kilometres of land we once knew? What happened to it?

This year, for the first time, one of the forecasts and predictions of our ancestors, the old people about two generations back was this: "One day, the way things are going, everybody is going to lose everything, and when everybody becomes a loser, then maybe we will be able to talk to one another." Sure enough, that is happening. We are now forced to talk to one another. We are now being forced to say what is true. The truth is about to come out and it will come out not very good. You know, for the first time, you see the world collapsing around us. One of the American Indians, years ago—they're called American Indians—made this prediction: "One day the white man's values are going to collapse. When they collapse, he's going to look for refuge, and he will look to the First Nations people for advice. He will look to their practices, because we have sustained this land for thousands and thousands of years." And I think that's where we are in terms of coastal management throughout Canada, throughout the world. The few people that run this country and this world have a stranglehold on each and every one of us.

There are four levels of survival. There's poverty, poor people, the middle class, and the wealthy. The people in poverty are us now. We're the ones born into poverty. We don't have anything. The poor people are the ones who lost something they once had. The middle class are now being attacked, and eventually it will reach the wealthy people, the ones who control everything. I believe that unless we convince those people that they have much to lose unless they begin to put into perspective the management of the land in its proper sense, we as a people...I learned this from my great-grandmother, who spoke very strongly about surviving. She said, "You better learn how to eat very little, great-grandson, because there will come a day when you're going to be hungry, and you won't know what to do when you're hungry. You won't know how to eat off that beach. Don't get used to that food that's being giving to you, because one day they're going to take it away from you."

They began to spoon-feed us, give us welfare cheques. They began to tell you that this is how much you can spend this month on food. Today our families, our families that live at this moment as I speak, have to decide this: "Do I put shoes on my child, or do we eat today? Do I pay the light bill, or do we sit in darkness so we can buy food?" And if you don't believe me, you go to any one of the villages in this province and in this country, and they'll tell you that.

So what I say to you tonight is that unless we begin to share power, share authority, and implement the true meaning of stewardship and a true relationship to the land, there will be nothing left for you or I to squabble over managing, because it will be gone.

I spoke to the youth the other day. I said, " You better start talking to your elders, because they're not listening to you. You young people at this university, attending this conference: it's not about evolving in an evolution of time that we're in; we need revolution. We've got to go the 360-degree turnaround, because you're not going to make that turnaround mending fences. It doesn't work. We saw that on the east coast in the fisheries. You see it in British Columbia, whether it's forestry, fisheries, or any other natural resource. It's all coming to an end, and we don't seem to realize it. The management skills that we have now need to be replaced with true skills: a true understanding of the land. I think that is what is important.

I'll be 63 on my next birthday. I remember when I first got elected as the chief of our village for a two-year term. I said, "By golly, in two years I'm going to change this world." Well, it's gotten worse since then, because no one is listening and no one wants to listen. The self-interest that lies within each one of you has got to be disposed of, because if you're here for yourself, then you're here for the wrong reason. Each one of us has the right to live, and if we keep depriving each other of the true management of this country, then we will have a revolution, one that we've never seen before. I honestly believe that it's already happening.

I know it's happening on the Saanich Peninsula. Out of the 13 beaches that we have on the Saanich Peninsula, there are only two left that are not totally saturated with pollution. The worst one is in North Saanich. We did tests. We looked at all the tests that are humanly possible. Victoria still dumps sewage out in the ocean—raw sewage, untreated—that's not management. Every time we have an election, whether it's on the reservation or in the municipality, or even at the provincial level, nothing changes. We're on this downhill slide, and we don't seem to know how to stop it because we're busy hanging onto what we've got, and we're going downhill with it.

I just wanted to pass this message on to you. But it's not all on the dark side. I think in gatherings like this, we have to learn how, first of all, to inspire one another. There's been enough, I believe, of depriving each other of the right to be involved. I heard the scientists say, "Well, the managers and the scientists never tell each other what to do. Everyone keeps their own thing and runs their own little square cubicle." I guess that as long as they receive a salary that's all right. But what about the poor people? What about those who are in poverty and who will never get out of it?

I want to leave this message with you: unless we as a people begin to realize it, everything that is happening to us will happen to your children and it will happen to your grandchildren. You are taking and depriving them of a future that will never be unless we pull together, and I mean together. Thank you.

A PANEL DISCUSSION: CANADIAN COASTAL ZONE MANAGEMENT: THE FUTURE?

From where have we come and to where are we going with coastal zone management in Canada?

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Introduction

In October 1978, the National Canadian Shore Management Conference (CZMC78) was held in Victoria under the auspices of the Canadian Council of Resource and Environment Ministers. The objective of those meetings was to set the stage for a sound and consistent approach to the management of coastal and shore areas throughout Canada. The intention was to enable the thirteen senior Canadian jurisdictions to take the principles, findings, and recommendations derived and utilize them within their respective political/administrative realities and constraints. Within the 20 year period to follow, not a single senior jurisdiction within Canada elected to either nominate or pass legislation with respect to management of the coastal zone per se. Nor did any choose to establish formal Coastal Zone and/or Resource Management (CZM) programs under other legislative auspices.

This, however, is not to say that Canada has been devoid of coastal zone management (czm) activity. During the 20 year period since CZMC78, numerous resource planning and management initiatives, that can be construed as coastal zone management programs, were established and undertaken in all corners of the country. Many are ongoing and are regarded as now classic sub-regional approaches to the integration of land-use and resource management in the coastal zone.

Until recently, the prevailing view was that formal CZM legislation and frameworks were not required in order to achieve and foster sound approaches to managing coastal land and resources. Does this still prevail? Is "ICZM" as interpreted by Canada's Oceans Act, ICZM at all? If not, what is it? And, what in fact should it be?

The lessons learned from the Canadian experiences in Coastal Zone Management over the past 20 years can provide Canada with a sound basis for the construction and fostering of frameworks that are needed for ICZM and Oceans management. Is this experience, in fact, being used, or even being heard.

Objective

As one of the initial sessions of the CZC'98 conference, this session was intended to introspectively address the questions:

- What have we learned from the experiences of the past 20 years of Canadian czm?
- To where and how are presently mandated initiatives in the areas of ICZM and ocean resource management taking us?
- How do these fit with and interact with the multi-level and multi-faceted interests within Canada's coastal zones?

This session was first and foremost intended as a forum for the presentation of a national (i.e. federal), Pacific Coast, Atlantic Coast, and Arctic Coast perspective on the direction, focus and manifestation

of prevailing and foreseeable coastal and ocean management initiatives. It was also intended to leave the participants, delegates and public with a clear notion of where and how the various pending and emerging policies may take Canadian "czm" within the next ten years.

Format and Participants

The format used was that of a modified panel discussion. The session was chaired by Jonathan Secter, of Secter Environmental Resource Consulting, Victoria, who formerly served the roles of I/C Coordination of British Columbia's ad hoc coastal management initiatives (1972-1987) and Chairman, Steering Committee for CZMC78.

Three Speaker Panels were featured:

A. Focal Panel of four Government Representatives

- Donna Petrachenko, Regional Director General, Pacific Region of Fisheries and Oceans Canada, represented the national/federal perspective on the intended and future Canadian ICZM and Ocean Resource Management, including Environment Canada initiatives and perspective.
- John Bones of British Columbia Land Use Coordination Office, Government of the Province of British Columbia presented the BC view of where and how coastal zone management is/should be proceeding.
- Andrew Cameron Director, Policy Planning and Coastal Resources, Nova Scotia Fisheries, presented the view(s) of the Atlantic Provinces of where and how coastal zone management is/should be proceeding.

B. Local/Community Commentators:

- Dan Edwards of the Westcoast Sustainability Association, Ucluelet presented a Pacific perspective.
- Asta Antoft of the Atlantic Coastal Action Program (ACAP-Cape Breton), Sydney, NS, presented an Atlantic perspective.
- Gordon Koshinsky, of the Nunavut Wildlife Management Board, presented an Arctic perspective.
- Noman Dale, Advisor to First Nations on Coastal Policy, Bella Coola, B.C spoke with reference to First Nations issues.

C. Coastal Practitioner Commentators

- Catherine Berris of Catherine Berris and Associates, Coastal Planners, presented the perspective of a Pacific Coastal Zone management planner.
- Dr. Peter Ricketts of Dalhousie University presented the perspective of an Atlantic Coastal zone academic and international practitioner.
- Bob Bell of the Fisheries Joint Management Committee, Inuvialuit Settlement region, presented the perspective of an Arctic coastal zone management biologist.

Each presented commentary and responded to aspects of any or all of the four focal speakers with respect to: observations; sense or non-sense; logic; clarity; flaws; realities; variations; consequences; implications; prospects; criticism; support; praise; advice; suggestions; recommendations; any or all as applicable.

The presentations and interaction among speakers took up the entire time period. The time allotted unfortunately did not allow for the entertainment of questions from the rather large audience. Due to technical difficulties, the proceedings of this session were not recorded electronically and therefore are unavailable for placement in these proceedings

It was generally agreed that such a session providing an update on accomplishments, directions, and commentary and challenges thereof would be most desirable at each of the ensuing Coastal Zone Canada Conferences. It was strongly recommended that it be scheduled as an evening session in order to allow sufficient time for audience questions and interaction, and that care be taken to assure that the proceedings are electronically recorded.

PERSPECTIVES ON COMMUNITY COASTAL ZONE MANAGEMENT

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"I think in gatherings like this, meetings like this, we have to learn first of all, to inspire one another. There's been enough, I believe, of depriving each other of the right to be involved."

Tom Sampson, Tsartlip Band

Context

The Public Forum, held September 1, 1998, consisted of six panelists and two keynote perspectives. The purpose was to provide views on integrated coastal management from groups not always considered in stakeholder-based processes. Each panelist was given a statement to address, as follows:

> " From your, or your organization's, perspective what is your role in furthering sustainable integrated coastal management at the community level, now and into the future?"

Each panelist addressed this question mostly from within the context of Canada's Pacific coast. The selected panel consisted of the following:

Honourable Dennis Streifel, B.C. Minister of Fisheries;
Deane Strongitharm, Vice-President, Oak Bay Marine Group; Executive Director Sportsfishing Institute;
Melinda Auerbach, Vice-Chair Islands Trust; Chair, Islands Trust Fund;
Dan Smith, Tribal Manager, Oweekeno Nation, B.C.;
Linda Michaluk, Mayor, District Municipality of North Saanich, B.C.;
Keith Moore, Laskeek Bay Conservation Society, B.C.;
Linda Coady, Vice-President of Environmental Affairs, Macmillan Bloedel Ltd.; and
Tom Sampson, Tsartlip Nation, B.C.

The Province of British Columbia View

Community-based management is a major thrust of the government of British Columbia—to work for the health of common property, for healthy fish stocks, for healthy forests and for healthy communities. These are borne out by the many recent community-based initiatives that include the joint Clean Water Action Plan for the Georgia Basin and the bilateral environmental cooperation agreement with the State of Washington on the shared marine waters. It also includes the community-driven processes such as the Central Coast Land and Coast Resource Management Planning process, the community clam management boards, and the Urban Salmon Habitat Program.

The Province of British Columbia released its Position Paper on Coastal Zone Management which reflects its interests, responsibilities, and actions to ensure the broad sustainability of coastal resources and communities. It will serve as a basis for the Province's discussions with the federal government to develop an oceans strategy for the year 2000, and will provide the framework for future provincial activities in the coastal zone.

The federal and provincial governments have also collaborated on the development of a joint strategy for marine protected areas which has been released for public and stakeholder comment. The draft strategy covers all aspects of what would be the marine protected areas process for the Pacific Coast including protecting areas of exceptional marine life diversity, of cultural/heritage features, and protecting ecosystems and recreational areas. This would be in the context of the needs of the coastal resource users of B.C. who, on behalf of Canada, are the stewards of over 27,000 km of shoreline. We have argued that British Columbians have a right to be involved in decisions which could change access to marine resources and that full and open consultation is essential to this involvement.

The B.C. Ministry of Fisheries is a new ministry with a mandate to develop B.C.'s approach to management of marine fisheries and other fishery related issues. The ministry's focus is on fish conservation and protection, new business opportunities, and fishery resource renewal. The process to do this will include coastal communities using consultative methods that are open.

As part of this commitment Fisheries Renewal British Columbia was recently established. This Crown Corporation is key to the government's efforts to conserve fish stocks, maintain fisheries related employment, and revitalize coastal community economies. It will be a partnership approach, based on communities taking responsibility for designing and delivering programs to renew fisheries in their areas. The health and sustainability of B.C.'s coastal environment are a vital key to the good health of the fisheries resource and coastal communities; we are committed to ensuring that this will be a legacy for the future.

Views from Marina Operators and Sportsfishing Industry

There is no doubt about the significance of the marina and sportsfishing industry to the economy of coastal communities. Each is a major employer and income generator, the sportsfishing industry alone contributes approximately $750 million to the provincial economy. In terms of environmental sustainability and sustainable coastal communities, current thinking is that community-based coastal management is the preferred direction.

In terms of these industries, reducing and streamlining government regulatory processes is desirable. The sportsfishing industry is part of coastal communities, and therefore would benefit from more local management. There are, however, certain issues within components of this industry (lodges, marinas, or other tourism-related activities) that warrant the following observations:

- It is unrealistic to assume that the economic and social restructuring occurring in resource-based coastal communities will be reversed with enhanced local management. All coastal based communities will have to adapt to the changing world markets and economic conditions;
- If community-based management means another layer of bureaucracy then its benefits are not apparent;
- If community-based management was controlled by, or empowered by, special interest groups in the communities, then it will not be beneficial. It must represent all groups;
- With respect to migratory fish (i.e. salmon), local management may in fact be counterproductive. To have local management competing for a share of the resource could prove difficult to implement equitably. Decisions on allocation and where to fish for these species clearly have to be made on a broader level;
- Ocean-based tourism could have a positive influence on the coastal community's evolving economic environment including jobs, realistic economic transitions, and play a key role in educating Canadians and the international community about B.C.'s resource-based strategies toward sustainability;
- Local communities can play a lead role through land use policies and consensus-building between tourism and the resources industries; and
- While local community management has merit, there needs to be certain overarching integrating processes that tie the individual community-based management strategies together.

Views of Local Government

The Island Trust

The views were presented from the perspective of two local governments—one representing an area of dispersed island communities, the other representing a rural residential coastal community.

The Island Trust is a collection of 16 corporate entities (islands) bound together by common goals, objectives, and legislation. B.C.'s Island Trust legislation specifically mandates a local government body to "preserve and protect the Islands Trust area for the residents of the islands and the province generally."

The three key components to the Trust are; The Trust Council, the local Trust committees, and the Islands Trust Fund. The local Trust Committees are responsible for development of Official Community Plans for each island as well as subsequent zoning bylaws. The Council sets the overall policy and operational direction of the Trust area, while the Fund holds land for conservation purposes.

The local committees set land and water use zones out to 1,000 meters offshore. These zones do not bind federal or provincial governments, but provide the option for the Trust zoning guidelines to be implemented. In this way island residents, through their local committees, have some control and regulation over use of the foreshore. As Official Community Plans are developed by the island residents, the final product is generally consensus-based and therefore not subjected to a multitude of amendments.

The Trust Council also plays a role in coastal management in that it is required to set the overall policy direction for the Trust area. This policy covering both the terrestrial and marine environment, should be the result of extensive consultation with the island residents. One example of a marine policy is the disfavour of ship sinkings for artificial reefs.

The Trust Fund was established to acquire significant sensitive lands. Roles include raising funds, receiving donations of lands or funds, and providing overall coordination of acquisition efforts within the Trust area.

To ensure consistency, and the ability to uphold objectives, the Trust has protocol agreements with several federal and provincial agencies hereby allowing the Trust Council, through the individual Trust committees, to provide outreach services on issues affecting the islands. The most recent example is the federal government's decision to divest itself of all public docks. These docks are the major access points for non-ferry based commerce and tourism. The protocol has encouraged the free-flow of information to the affected communities as well as the options for maintaining these vital facilities.

North Saanich

Another local government perspective was provided by the mayor of North Saanich, a small coastal municipality on the north end of the Saanich Peninsula near Victoria, B.C. The 11,000 residents are informed, involved and have placed high expectations on their municipal representatives to uphold their interests in protecting the values of the area. It is thus important the municipal council have high community support in order to exercise, to the fullest extent possible, its limited powers in coastline management.

The Municipal government has solid support, which has resulted in bylaws and policies that afford a level of shoreline protection. One mechanism to do this is through an open decision-making process that includes splitting the citizen advisory commissions into both planning and environmental advisory functions. In this way specific community-based expertise within each commission allows for sound recommendations. For the Council's and the public's part, they can clearly see the basis for these recommendations and appropriate decisions can result. In addition, the official community planning

process has a general section on environmental protection with a specific section on shoreline uses. North Saanich has classified and mapped its 36 kilometers of shoreline according to sediment transport direction, shallow intertidal areas, etc.

Another local government planning tool is the use of development permit areas. For example, North Saanich was the first B.C. coastal community to regulate the siting of marinas and private yacht clubs This tool is essential to balance the important recreational boating/marina activities and the sheltered, environmentally sensitive regions in which they are apt to be located. The development permit process allowed the municipality to minimize impacts to adjacent uses, retain public access to the shoreline and to reduce impacts on shoreline processes and aquatic and wildlife habitats. Guidelines lay out the municipality's requirements within these areas. The value of this approach is that it clearly sets out expectations, which over time, helped develop a positive relationship among the marina owners and the municipality.

Zoning, the more common municipal level tool to regulate and guide development within the district, was used to create "no dock" zones along sensitive shorelines, most of which were privately owned. This move protected habitat and sediment transport processes, and allowed access to the publicly owned intertidal areas. Public access to the shoreline is important, so while protecting the intertidal areas, the municipality also ensures that its dedicated road allowances that end at the shorelines are planned in such a way as to allow public access and protect the interests of adjoining properties. Because the public has ample access points to beaches, the community awareness and "ownership" of these assets has increased to the point that incidences of abuse or non-compliance with zoning regulations are rare.

A First Nations View

The First Nations context must be considered when defining integrated coastal zone management. The Indigenous rights and recognition of indigenous peoples has been advocated in Canada from 1763 with the royal proclamation of Canada, through to the 1982 Constitution of Canada [Section 35(1)]. As well, First Nations of Canada were not conquered nor were lands ceded, though there are treaties in some parts of Canada, but not in all. Within the *Fisheries Act* of Canada, aboriginal peoples interests come first after conservation. This aspect is still being defined with all governments.

First Nations of Canada had traditional laws, which gave responsibility and accountability to the peoples for the resources of their regions. These laws still exist and are still practiced through a clan or hereditary system.

There are "recent" organizations called Indian Bands - 197 in British Columbia, 630 in Canada. Many of these are in coastal communities, and various organizations have been established (i.e. BC Aboriginal Fisheries Commission, Kwakiutl Territorial Fishery Commission or the South Island Coast Salish) to manage the resources—both natural and human.

By way of a specific example, the Rivers Inlet region of the Central Coast of British Columbia is home to the Heiltsuk, Kitasoo, Naxalk and Oweekeno First Nations. In this region traditional authorities are maintained and there is concern about the management of people, particularly the "new" exploiters of the forest and fish resources. It is clear that the type of exploitation, pollution and endangerment of species and habitats occurring in the Fraser River, the Strait of Georgia, and Southern Vancouver Island regions is not desirable for the central coast area.

First Nations are now advocating and lobbying their local community management as per our tradition over thousands of years. Management is done through a clan system, a council, and by consultation using consensus and participatory management. The challenge is to use this process to overcome the recent notion that natural resources are there forever. The reality is they are not; hence the First Nations philosophies and principles of holistic management are ever more important.

Coastal zone management is inherent within the First Nation's traditions and culture through their belief that all natural things are related and respected. Even at first contact with non-aboriginal peoples, First Nations were practicing and offering principles of sustainability—not sustainable development—very different approaches.

Defining the original coastal communities is difficult in light of the cities that have grown around and within traditional territories. The management of natural resources has been taken away, and the resources themselves have been depleted or their use reduced because of pollution. Contrast this to the First Nations' philosophy and principles of looking at things holistically by connecting spiritually and emotionally to natural resources prior to using and managing them. It becomes clear that it is the people that must be managed not the natural resources.

A Community-based Conservation Organization View

The Laskeek Bay Conservation Society is a small organization based in the six communities of B.C.'s Queen Charlotte Islands. The message delivered is that the coastal zone is a very diverse concept and that what's appropriate to one community may not be for another. To determine what is appropriate at the community level requires an accounting of the people living there and what's of interest to them.

The Conservation Society originated around continuing research conducted on the Ancient Murrelet, a small, burrow-nesting seabird. Most of the worlds' population is found breeding on the British Columbia coast. Because it is mostly a marine species, only coming to land to breed, it is a symbol of the of the Islands ecosystems and a measure of the systems vulnerability to outside forces—including coastal oil development, introduced species, and tourism. Thus when the original government-sponsored research on this species was canceled, the Society took over the monitoring program.

The motivational factors for taking this project on were: an involvement in long term monitoring studies; committment to a project that would help us understand environmental health; community level involvement in research in the coastal zone; and, to participate in the decisions that result from these studies.

Four purposes of the Society are; 1) to commit to long-term monitoring of marine animals (salmon related issues excluded); 2) to provide an opportunity for students and residents to participate in field studies; 3) to provide and disseminate information on our islands' rich environment to the communities; and, 4) to operate as a partner with federal and provincial government programs undertaking coastal-related work.

In terms of furthering integrated coastal management, the Society continues to make a strong contribution to long-term monitoring and research in order to understand this environment. Through the many volunteers, a large database has been compiled. A volunteer system is an important model to follow when you know government funding rarely exceeds five years, yet the need for longer studies is imperative. The other contribution is the involvement of locals in field studies, providing them a closer association with the knowledge generated. This allows for a more immediate implementation of any management plan because there is a greater likelihood for public support.

A case in point is the impact introduced species are having on the viability of islands seabird breeding colonies and on forest composition. The required actions to remove these species would not have been possible were it not that people of the communities were part of the original data gathering. As a result, the community, through the Society, is committed to monitoring recovery once the introduced species has been removed.

The expected contributions of the society to the future will be an increased knowledge and appreciation of issues and the provison of local advice. It is not direct participation that empowers local community in resource decision-making. To avoid volunteer "burn-out" requires that they work directly on issues, to provide information to a broader decision-making process.

A Forest Industry View

The perspective of one large coastal-based forest, is to balance its operations from the very local level through the national and on to the international arena for forest products. MacMillan Bloedel, one such company, is going through a period of tremendous change in order to meet the above objective. We believe there is no single approach, and that variations will depend on location, partners and geographic situations. We assume that all groups involved in management of coastal resources have made mistakes, however we are learning from these mistakes.

MacMillan Bloedel has participated, with other community-based stakeholders, in a series of locally-based community planning processes. These have created local employment in the forest and value-added sectors as well as, assisted local, small businesses by providing log sales and trades and developing joint infrastructure. Some partnerships include local communities and First Nations on such ventures as silviculture, forestry, and watershed streamside restoration. Also at the local level we have cooperated in adding value to byproducts from locally based forestry and manufacturing operations. Where economically feasible, some operations were moved closer to employees and local community businesses to improve access to byproducts. In some instances partnerships have included local communities, First Nations and businesses with the objective of developing new approaches and new knowledge on conservation and sustainable management of both timber and non-timber resources in coastal forests.

What should the company be doing in the area of sustainability along coastal B.C.? The company is undergoing major restructuring to meet this challenge, with all aspects of the company's operations undergoing review. The status quo is not acceptable.

Two significant changes are being implemented. The first is a call for a public debate on stumpage and tenure reform for coastal B.C., which if successful would increase opportunities for local involvement at the management and fibre supply levels. The second is a three-element corporate forest policy initiative which moves away from clearcutting, increasing retention of old growth forests within commercial forest lands operated by the company and pursuing of eco-certification for products produced by MacMillan Bloedel.

MacMillan Bloedel has undertaken an enormously complex task. The company has recognized that the time has come to make some independent moves and thereby encouraging others to join in, in what could be a very lively and dynamic debate. A debate with many implications for coastal management and local community involvement.

A Synthesis of the Views

The panelists represented a diverse range of views and observations with respect to perceptions on their roles in integrated coastal management. Given this, were there any common themes or messages that could be drawn from this session?

The Province of British Columbia outlined its interests and initiatives that support coastal resource management. It was clear that the needs and interests of coastal communities will be part of the decision-making processes now and into the future. It was particularly emphasized in the context of the province's fishery resource. The marina and sportsfishing industries generally support the need for local involvement in decisions, but caution that not all decisions on integrated coastal management be left to the local

level. There is a need for broadly applicable policies and regulations, after appropriate local consultation, with respect to issues such as harvest allocations and the like.

Local governments certainly have a role, though limited, and already have a number of tools available to them. The significance of that role and the direct involvement of local governments in coastal management issues was proportional, it would appear, to the interests and expectations of the residents of these areas. Local government councils can exercise significant influence on activities not necessarily within their jurisdiction when they have the support of the residents. So in this case, community-based management is a reflection of the interests and awareness of the residents through their elected councils.

The prevailing First Nations view of management of coastal resources is rooted in a long association with and respect for all aspects of the natural environment. As such, management occurs holistically through a clan or hereditary system of ownership. The traditional laws still operate in many of their coastal communities. The challenge before them is to find ways to strengthen and enhance these laws when working with non-First Nations interests in the marine and forest resources. The barriers to do so are beginning to be removed through negotiation and interpretation of the First Nations rights and interests. The process to do so has been, and will continue to be, a consensus-based and participatory management process.

While several of the panelists spoke from the "community-at-large" perspective, what of the organizations within communities? The representative from this perspective spoke from the conservation point of view but acknowledged the existence of alternative views. At the outset it was noted that what is interpreted as coastal management within one community may not, and likely will not, apply to other coastal communities. So any notion of a blanket coastal policy meeting the needs of all communities is not valid if there is no room for adapration to meet specific local needs. The clear message conveyed was that with local interests directly involved in the implementation or carrying out of studies then tangible benefits will result. This includes the sense of ownership and control of outcomes, local employment and skills development, better and more relevant resource management decisions and the general heightened awareness of the community residents on the issues that affect them.

The coastal forest industry must balance the fact that it is both a local community employment base, and a significant contributor to the provincial economy, while an international competitor in forest products. The challenge is to balance these factors and still remain competitive. Major changes are occurring within the industry which have not only required a enhanced stakeholder process at the community level, but also the need to change corporate policy on forest practices. These moves are not only to meet the new environmental requirements, but also to ensure the individual company operations can remain sustainable and thus provide security of dependent communities. There is no doubt that as more of these changes are implemented, and more companies participate, there will be implications for the future of coastal management and local community involvement.

THE NEED FOR SCIENCE IN THE COASTAL ZONE A CASE STUDY: THE RICHIBUCTO ENVIRONMENT AND RESOURCE ENHANCEMENT PROJECT

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Introduction

The medium-sized Richibucto River (drainage basin area of 1080 km^2) empties into the southern Gulf of St. Lawrence in New Brunswick, Canada (Figure 1). The Richibucto is home to roughly 10,000 people of three different cultural backgrounds: french-speaking Acadians, settlers from the British Isles, and the original inhabitants—the Micmaq people. There are two First Nations living on the shores of the Richibucto Estuary—Indian Island in Richibucto Harbour and Big Cove, which is Atlantic Canada's largest First Nation community.

For some time there have been concerns about the health and productivity of the Richibucto River that have been shared by all three cultures, but there has not been a coordinated, concerted effort to address these problems. This is changing. There is now the will on the Richibucto to come together to address the problems that affect the shores of the River and its estuary. This coming together is reflected in the logo of the Richibucto Environment and Resource Enhancement Project (REREP)—the three communities working together to restore the health of their environment and to enhance the resources that it provides (Figure 2).

Science plays a pivotal role in REREP and that's what this special session was all about. There are two themes that ran through the presentations made in this session and these were the take-home messages:

1. The questions and concerns being addressed come from the stakeholders—the people that live and work on the river. Scientists in the universities and government institutions provide science as a tool to address the questions. Examples that will be discussed include: use of the shellfish resource which is presently contaminated by bacteria; opportunities for aquaculture and possible conflicts with other activities; impacts of the local peat moss harvesting industry, and the potential for enhancing the recreational fishery for striped bass.

2. In all of REREP's component projects there has been a conscious effort to build bridges—to include everyone who might have an interest. This means the three cultures, but it also means local industries, universities, governments at all levels including municipal, band council, provincial and federal and it means non-governmental organisations concerned with the environment such as the Richibucto River Association.

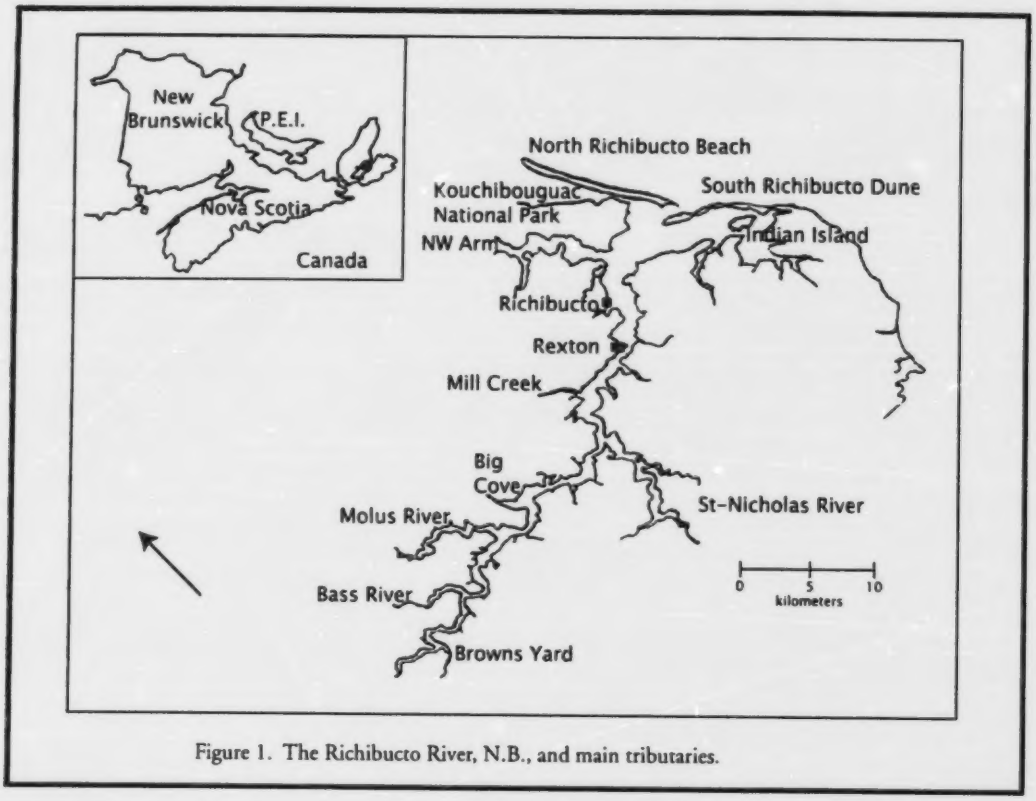

Figure 1. The Richibucto River, N.B., and main tributaries.

The REREP special session was comprised of six platform presentations and two posters. While not all aspects of the science being undertaken by REREP could be covered in the two hour session, there was an attempt to cover the project's highlights and to portray its diversity. Regarding the latter objective, there was an attempt to represent the many constituencies involved in problem solving—many but not all of whom are listed in the authorship of this summary.

The first two presentations were general in nature and set the stage for the more technical presentations. In the first presentation entitled "Steering science through the community: the Richibucto sustainable development project", Dr. Barry Jones introduced the New Brunswick Sustainable Development Program, a contributing partner to REREP. He illustrated how both programs work to bring together stakeholders with concerns, and scientists to help address those concerns.

In the early 1990s the harvesting of shellfish on the New Brunswick shores of the Gulf of St. Lawrence was subject to increasing closures due to high coliform counts. This resulted in significant economic hardships on both the fisheries and aquaculture industries, and consequently on local communities. An appeal to government from the affected communities generated the development of a watershed-based, community-driven model for the implementation of sustainable development. It focuses on the coordination of effort from all sectors of communities within watersheds and all levels of government. The goal is to identify problem areas and data gaps which can be addressed by science such that scarce research funds are utilized efficiently to improve water quality as well as other issues. The Richibucto Sustainable Development Project is the sixth of such projects in New Brunswick. It is distinct from the others in that it is being conducted in partnership with the Université de Moncton, which is simultaneously focusing on the economic development of renewable aquatic natural resources.

RICHIBUCTO ENVIRONMENT AND RESOURCE ENHANCEMENT PROJECT
PROJET ENVIRONNEMENTAL ET DE MISE EN VALEUR DES RESSOURCES DE RICHIBOUCTOU

Figure 2. Logo of the Richibucto Environment and Resource Enhancement Project portraying the three communities joining hands to manage their common environment

The second presentation, was made by Dr. Harald Rosenthal, the University of Kiel, Germany, and his co-author Howard Edel from DFO. They explored the application of science to a mounting problem in coastal areas including the Richibucto: the environmental impacts of aquaculture and conflicts with other coastal activities. Aquaculture is at present the fastest growing sector within fisheries and will continue to develop in coastal waters. While in the past, scientific efforts were mainly directed towards the identification of the ecological impacts of aquaculture in coastal areas, recently threats to aquaculture by other coastal resource users have been recognized. The Richibucto Estuary is home to one of the largest bivalve aquaculture operations in the southern Gulf of St. Lawrence, and REREP is actively exploring opportunities for the culture of different species and in different areas. To date no conflicts with other users have been reported, but experiences elsewhere suggest that such conflicts will occur unless they are anticipated and incorporated into comprehensive management plans. Science has a role to play in identifying, quantifying and minimizing environmental impacts derived from aquaculture in such areas as: i) development of scientific criteria for site selection, ii) resource partitioning, iii) effects of co-culture and poly-culture, iv) development of integrated farming systems, v) quantification and mitigation of conflicts occurring with fisheries and other coastal-based industries such as shipping, logging, tourism, and vi) the development of management tools such as predictive modeling in areas of uncertainty.

Dr. Andrew Boghen and André St-Hilaire from the Université de Moncton spoke next on the origin and structure of REREP. Dr. Boghen is the director of REREP, and of the Environmental Sciences Research Centre at the Université de Moncton through which the project is administered. André is the project manager.

Like other watersheds in Atlantic Canada, the Richibucto ecosystem has, over the years, become badly perturbed, with many of its natural finfish and shellfish populations either significantly reduced or totally depleted. In neighbouring watersheds, such problems have given rise to active community-driven groups who have identified environmental problems and initiated remediation programs. For example, the Miramichi River Environmental Assessment Committee (MREAC) has been working since 1989 to address the health of the Miramichi River; to learn more about the ecosystem, and to reduce inputs of industrial and municiple wastes. The same cannot be said for the Richibucto River. Perhaps because of its smaller size and population base, lack of major industries, and because of tensions among the three cultural communities living around the Richibucto estuary, there has not been a concerted effort to address environmental concerns until recently. This began changing in 1994 with the formation of the Richibucto River Association who with REREP's collaboration, identified priority environmental concerns and plans for remediation in their 1997 Action Plan (Richibucto River Association 1997).

As of early 1995, the Environmental Sciences Research Centre (ESRC) of the Université de Moncton, in collaboration with the communities of Richibucto, Big Cove, Rexton and Indian Island and other partners (government agencies, scientific & academic institutions and voluntary organizations) embarked on a multi-phase, multi-disciplinary project. While the long term objective is to contribute toward social, recreational and economic benefits for the residents of the area, the more immediate aims include:

i. acquisition of basic knowledge about the ecosystem along with the fauna and flora that inhabit it;
ii. specific identification of sources that contribute towards a deteriorating aquatic environment;
iii. defining appropriate rehabilitative measures to resolve some of the problems;
iv. the application of newly-gained information toward the development of strategies that will eventually help enhance certain targeted species, either in terms of improved fishery catches and/or aquaculture;
v. explore and recommend ways of developing ecotourism in relation to the aquatic environment.

The program is "community-based." Its success depends on cooperation and the establishment of partnerships among the users of the resources. Ongoing research projects include:

a) determination of chemical contaminant levels in estuarine biota;
b) quantification and description of spawning and nursery habitat for striped bass;
c) quantification and description of use of the estuary by other fish species—particularly white perch (*Morone americana*) - for spawning and early life history;
d) determination of the effects of commercial peat moss harvesting on estuarine biota;
e) determination of the potential for aquaculture of new bivalve species; and
f) examination of parasitism in bivalves as an indicator of environmental stress.

Research initiatives on striped bass (b) and peat moss harvesting (d) were by graduate students Michael Robinson and Christine Ouellette (see below). Contaminants in estuarine biota were examined by Université de Moncton student Céline Surette working with Guy Brun from Environment Canada and Victorin Mallet from the University. Their work, summarized here, was presented in two posters at CZC '98.

In 1996-97 Environment Canada established a network of 23 sampling stations in the Richibucto watershed, from which the following physico-chemical variables were measured: dissolved minerals and hardness, pH, alkalinity, buffering and acid-neutralizing capacity, colour, dissolved organic carbon, nutrients (e.g., nitrates, phosphorous), oxygen and metals. In areas of restricted water flow, behind causeway-type bridge structures, nutrients tended to be elevated consistent with eutrophication. Many of these areas are conditionally closed to shellfish harvesting due to fecal coliform pollution. emediation would require reducing inputs of organic effluents or increasing circulation and mixing by modifying/ removing bridge structures.

In addition to characterizing water, metals were measured in four species of fish. Concentrations of 14 heavy metals (Al, Be, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Se, Sn and Zn) were determined in American eel (*Anguilla rostrata*), Atlantic tomcod (*Microgadus tomcod*), mummichog (*Fundulus heteroclitus*) and sand shrimp (*Crangon septemspinosa*). The first two were selected because they move throughout the estuary and they are of interest for human consumption. The mummichog and the sand shrimp were selected because they are somewhat sedentary, thereby representing specific sites, and they are also low in the food chain. The four species were collected from each of the three major branches of the lower Richibucto Estuary; the Northwest Arm, Indian Island, and Richibucto (Figure 1). The three sites shared similar habitats and physico-chemical conditions. The heavy metal concentrations in these four species were similar to, or lower than, those in fish from other estuaries in the southern Gulf of St. Lawrence (Miramichi Estuary, Restigouche Estuary). There was no indication of a problem in the Richibucto Estuary (Surette, 1997). Generally, mercury concentrations were lower than in other estuaries, but there was clear evidence of bioaccumulation in the food chain. Also, in the case of the sand shrimp, spatial variations were found both within the estuary and among other estuaries in the province (Brun et al., 1997).

More recently Ms. Surette rejected the hypothesis that peat moss, spilled accidentally by the peat harvesting industry into Mill Creek, would increase mobilization of mercury and contamination of resident animals. Concentrations of total mercury were higher in the peat delta than in mud and sand substrates upstream or downstream in Mill Creek, but were not elevated in the brackish, estuarine water, and most importantly, were not elevated in local biota including fish (mummichogs), sand shrimp and blue mussels (*Mytilus edulis*).

One of the major stakeholders of REREP is The Indian Island First Nation. Community members want to develop pilot projects in aquaculture. Traditional ecological knowledge proved helpful in initiating this project. Elders told of times when surf clams (*Spisula solidissima*) were abundant. A study was initiated to investigate the potential of the waters near Indian Island as clam grow-out sites. One concern was the impacts of winter ice. Preliminary results show that ice scouring may be a problem in certain areas, but that conditions elsewhere are likely amenable to clam aquaculture (Boghen *et al.* in prep.). Local stakeholders have been integrally involved with the research project from identifying of issues requiring new knowledge, through execution of the research, to interpretation of the data and planning of the next steps. This principle was demonstrated by Mr. Garfield Barlow, Indian Island First Nations, in his presentation, "The role of science in the development of the MicMaq community of Indian Island." Mr. Barlow explained how, over years, the MicMaqs have seen their traditional lands and waters ravaged by pollution and imprudent resource harvest. Bountiful resources, which their ancestors harvested conservatively, have dwindled, in some instances to the point of extinction. Living on modern reserves they have been squeezed into tight corners, severely restricted in the use of the waters, and forced to obey modern notions of conservation. It is suggested that what hopes are left lie in the cradle of modern science and in the proposed practices of today's society.

With this background in mind and initially with much reservation, Mr. Barlow agreed to participate in the formation and nurturing of REREP. "I have done this on behalf of my people because I believe that there is little hope for the coastal environment if we don't get involved and make every possible effort to work together. Most importantly, however, my motivation was fueled by a desire to leave something of our heritage to my children and grandchildren.

Aside from my involvement in the overall REREP, I am participating in a scientific study conducted in conjunction with the Université de Moncton, to explore the potential for clam culture in our waters adjacent to Indian Island. The study includes the identification of suitable culture sites and appropriate grow-out technology of the surf clam, along with an appreciation of the potential impact and limitations imposed by ice behaviour on the development of shellfish culture.

Without necessarily expecting written guarantees, the science in which I agreed to participate, has to be understandable and relevant. It must be formulated, to the extent possible on a partnership basis, be

sensitive and ready to consider the incorporation of traditional knowledge and, most importantly, demonstrate promise that it could eventually contribute to long-term social and economic viability for my community.

First Nations people living in my community of Indian Island and the other reserve on Richibucto estuary at Big Cove have seen many well-meaning professionals come from the universities and government departments over the years. They carry out their short-term projects, they leave, and we never hear from them again. Dr. Boghen promised that REREP would be different in both the nature and duration of the relationship between the Université de Moncton and local stakeholders like my community. I am here today to tell you that he has been as good as his word."

The final two presentations in the REREP special session dealt with specific environmental and resource issues of concern to the Richibucto watershed stakeholders. Both projects were presented by graduate students working with REREP. Ms. Christine Ouellette, an M.Sc. student in the Biology Department at the Université de Moncton, expanded on work introduced earlier in this review on impacts of peat harvesting in a talk entitled "Potential environmental impact of peat moss harvesting in the Richibucto River, New Brunswick, Canada", by fellow student Céline Surette. Peat moss harvesting is a widespread industry along the Gulf coast of New Brunswick. As part of REREP, an investigation was undertaken in 1996 into the impact on the aquatic ecosystem and subsequently on shellfish culture, of peat spilled by a harvester into Mill Creek, a tributary of the Richibucto River. Most significantly, the peat-harvesting industry is supporting the research and working with REREP to understand impacts of spilled peat on the environment, and how best to mediate adverse effects. The objective was to determine the effects of peat on the biodiversity and health of aquatic organisms, as well as the overall water quality and bottom substrate. This project includes histopathological and parasitological analyses, and behavioural experiments on sand shrimp, but the work presented at CZC98 emphasized the numbers and types of animals found in relation to peat concentrations. Aspects of this work have been presented and summarized elsewhere (Ouellette et al. 1997). Ten stations were established along a 1 km stretch at varying proximities to a peat delta formed at the confluence of the creek draining the peat-harvesting operation and Mill Creek. Samples were collected with beach-seines, grabs, and sediment cores. Surveys in 1996 and 1997 indicate an inverse correlation between density of certain fish and shellfish species and peat moss depth. Also, sand shrimp, under laboratory conditions, preferred a sand substrate to peat—consistent with *in situ* observations. Together, these results suggest a loss of fish and invertebrate habitat in the estuary directly impacted by commercial peat. The work is ongoing; detailed quantitative analyses on historic as well as current data are in progress.

The final presentation in the REREP session addressed a specific concern the Richibucto River Association (RRA). In its 1997 Action Plan, RRA indicted a need for more ecological knowledge about striped bass (*Morone saxatilis*). Striped bass are the most important recreational fish in the eastern United States coastal waters. While less abundant in Canada, they are still of great interest to Maritime fishers. The RRA asked if there is a self-sustaining population of striped bass in Richibucto River that can be enhanced to support a major recreational fishery? Graduate student Michael Robinson, Biology Department, University of New Brunswick, presented some findings in his talk, "Spawning and early life history of striped bass in the southern Gulf of St. Lawrence."

Tonnes of large striped bass were landed from the Richibucto River in past decades, but the perception of local inhabitants suggests few fish remain today. A survey was undertaken in 1997 and 1998 to determine whether striped bass spawn in the Richibucto River or its tributaries—the Bass River and Molus River, or in the neighbouring Kouchibouguac River. No striped bass eggs or larvae were found in the ichthyoplankton of the rivers surveyed between May and August. Small numbers of white perch (*M. americana*) eggs and larvae were found in the Richibucto, Bass, and Molus Rivers and eggs and larvae of other pelagic species, primarily gaspereau (*Alosa* spp.) and rainbow smelt (*Osmerus mordax*), were caught in all four rivers, indicating that sampling techniques effectively collected pelagic larvae. Beach-seining surveys in the estuaries' littoral zone yielded no underyearling striped bass in June and

July, confirming the ichthyoplankton surveys' results. However, large numbers of white perch were observed. Interestingly, underyearling striped bass (5-8 cm fork length) appeared near the mouths of the Richibucto and Kouchibouguac Rivers in late August, as had been observed for the Kouchibouguac River in 1996 (Robinson et al. 1998). The underyearling striped bass origins were suspected to be the Miramichi Estuary, the only confirmed striped bass spawning area in the southern Gulf of St. Lawrence (Robichaud et al. 1996). Therefore, intertidal beach-seine surveys between Richibucto and Miramichi were made in late August. Underyearling striped bass were caught all along this corridor confirming migration among rivers. By the end of August they had penetrated the Richibucto Estuary at least as far as the Molus River. Microsatellite DNA analysis are underway to determine the genetic relationship among bass caught in the Kouchibouguac and Richibucto and Miramichi Estuaries (Robinson and Courtenay 1999).

These may be the first data to suggest that underyearling striped bass leave natal rivers to disperse through coastal waters to contiguous rivers where they subsequently spend their first winter. The importance of this observation for striped bass management in the southern Gulf of St. Lawrence is threefold: first, that spawning cannot be inferred from the presence of underyearlings in late summer, fall or winter; second, that non-spawning rivers may still provide important nursery habitat for juvenile striped bass; and third, that the Miramichi River may be the only spawning site for striped bass in the entire southern Gulf of St. Lawrence. If so it merits enhanced protection such as could be conferred under Marine Protected Area designation. Finally, it appears there is not is a self-sustaining population of striped bass that might support an enhanced recreational fishery in the Richibucto River. However, the smaller cousin of the striped bass, the white perch, is abundant throughout the watershed. Some anglers consider white perch excellent fishing and eating (Munro 1998). Perhaps an expanded recreational fishery on this species would be of benefit to the residents of the Richibucto River area.

The work presented in this session shows science can make an important contribution to coastal community integrated management. Although many questions remain unanswered about the Richibucto River system, the progress has had repercussions on the interactions among local communities, the health of the ecosystem and the enhancement of crucial resource-based economic activities such as aquaculture.

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COASTAL ZONE CANADA '98 YOUTH CONFERENCE

From little things, big things happen. For the past three days, nearly a hundred youths participated in the first ever Coastal Zone Youth Conference. We gathered from all over the globe. Some of us have lived on the coast all our lives while some have never seen the coast. This helped to bring different perspectives into our discussions, and helped us to better understand the complexities of the coast. We explored many different aspects of coastal zone management, and came to the understanding that culture, environment, and economics all play a part in the management of our coast.

The achievements that occurred out of the Youth Conference:

1. We developed a genuine concern, support and enthusiasm for the challenges of this subject;
2. We recognize the diversity of interests and values in coastal zone management and the need for a common language to communicate;
3. We recognize the importance, value, legitimacy, and spirituality of all knowledge; community-based knowledge, traditional First Nations knowledge, scientific knowledge, creative knowledge, ethical and intuitive knowledge, etc., and its integration;
4. We need help, and need resources to complete the tasks; and
5. We have a commitment and an understanding of the responsibilities and initiatives required to implement change.

We offer the following tools:

- Fresh perspective and opinions;
- Diversity, knowledge and experiences;
- Time and willingness to volunteer; and
- A list of Youth Conference participants for the web site.

We ask you to actively involve us. We present five challenges:

1. Take some action personally, in changing your lifestyle. Go down to your favourite beach and clean it up if for no other reason than it might make you feel good;
2. Take stock of your lives and your impact on the earth and the others around you—practice what you preach;
3. Take a new approach when facilitating discussions—don't be afraid to be either a leader or to relax
4. Take a non-anthropocentric outlook at the world around you—put yourself back into it. Take another perspective while attempting to see other points of view. Be open to all sides of the issue; and
5. When discussing science, sociology, and economics, add your spirituality. Use your heart and guts when presenting material or when working with the community.

Youth have good ideas. We want to be heard. The achievements, tools and challenges are presented to you. In closing our conference, one thing we found important was our intuition, so to close with a quote;

"It is with our hearts that one sees rightly. What is essential is invisible to the eye."

PLENARY ADDRESS
AN OCEANS VISION

Dr. Scott Parson, Assistant Deputy Minister
Fisheries and Oceans Canada

Introduction

Good Morning Mr. Chairman, Conference delegates. I'm pleased to have the opportunity to say a few words to you at the closing of this conference. We have heard some different views about the success of a conference like this and what it achieves. I believe it has been useful and thought provoking for all of us. And I would like to congratulate the organizers and volunteers, presenters and participants, everyone has played a major role in making this conference a success. You have heard presentation after presentation over the last several days. You've attended workshop after workshop. So you have heard a lot of ideas, and it is now most difficult to toss new ideas into the cauldron. Rather than attempt this, I will give you my perspective on where we are going.

I believe that one of the major benefits of conferences is the learning and information sharing that occurs. Some take-home messages are:

- that effective coastal zone management is critical to conservation and sustainable use in our coastal zones;
- that effective coastal zone management requires an integrated and collaborative approach;
- that integrated management is not an easy task;
- that we need to take a comprehensive ecosystem-based approach;
- that we need to improve our scientific knowledge of oceans and ocean resources, and make more effective use of that knowledge in coastal zone management;
- that public involvement is crucial;
- that community-based and local-level management initiatives are critical;
- strong support by government at all levels is necessary;
- that moving from theory to practice is difficult but progress is being made;
- that planning requires the full involvement of the youth of today;
- that coastal peoples of the world have a strong interest in integrated management of the oceans, and they also possess a vast wealth of traditional ecological knowledge that complements the scientific knowledge required for successful integration; and,
- that only through dedication and collaboration can we achieve integrated management of oceans activities.

One key message is that coastal peoples of the world have a strong interest in integrated management of oceans, coastal zones, and coastal zone resources. Not only do they have a strong interest, they possess a traditional ecological knowledge, which needs to be harnessed to complement the more traditional scientific knowledge. All of this is needed for effective integrated management, and as well, we need leadership and commitment at all levels. Only through commitment, through collaboration, can we achieve successful, effective management of oceans and coastal zone activities and resources.

In spite of some scepticism, this conference has illustrated that progress has been made in many areas of the world in trying to advance integrated management concepts and approaches in the coastal zone. But it is usually a a difficult struggle, and clearly, many daunting challenges remain. The future of our oceans ecosystems and resources, indeed the planet, depends upon the dedication and commitment of all. Not of some people sitting in Ottawa or some other government capital. Not of some people in provincial

governments or capitals. But upon the dedication and commitment of all of us and people like us who's actions, individually and collectively, will shape that future.

Our Youth are very aware of the challenges we face in estuaries, coastal zones, and marine waters. This was made clear by what we heard from the Youth Conference here at CZC '98. I was immensely encouraged by the interest and commitment of the youth who spoke to us Sunday night. They emphasized the need to act through our own lifestyle, to take new approaches, to facilitate, but also to lead. They also stressed the need to be open to differing perspectives rather than just advancing personal agendas. We must listen to our youth. Their world will be shaped by our actions or inaction today.

Around the world we are at a threshold where problems of international, national, and also local significance must be addressed through visionary leadership, cooperation, and dedication to conservation and protection of our oceans, our coastal zones, and their resources. Conferences such as this make use even more aware of this.

The Oceans Act

Here in Canada we are going through a major change. We now have a major new piece of legislation, The *Oceans Act*, which became law in 1997. This legislation is not the miraculous solution to integrated management, but it does provide a framework for entry into a new era of oceans management for the 21st century for Canada. It does offer opportunities to move forward. As many of you might be aware, in Canada government attention to the need for an integrated oceans and coastal zone approach has waxed and waned, ebbed and flowed over the years. But just a few years ago, in the mid-1990's, the federal government realized that development of a comprehensive approach to oceans and coastal issues requires a strong legislative base for it to be taken seriously.

We had a national advisory board on science and technology in 1994, which submitted a report to the Prime Minister and that recommended a need for an Oceans Act; The government acted on that recommendation. One key point of this legislation is the emphasis on integrated management in Canada. It identifies a clear lead, that lead is the Minister of Fisheries and Oceans.

The Act obligates our Department and our Minister to act as stewards of Canada's oceans and ocean resources. The *Oceans Act* also establishes the legislative base for a new comprehensive Oceans Strategy to be developed through collaboration and co-operation with all those with an interest in the conservation and sustainable use of Canada's oceans. The *Oceans Act* provides a new approach to oceans management, an approach that has to involve the federal government working in collaboration with those who have an interest in the future of our oceans, our coastal zones and their resources, including provinces, territories and First Nations, local communities, sectoral interest, industries, and environmentalists. The strength of the *Oceans Act* lies, in large part, in its recognition of the central importance of integrated management and sustainable development through partnering, networking and community involvement.

The Principles of the Act

The *Act* is based on several main principles; sustainable development, integrated management and a precautionary and ecosystems approach to management. Although these principles are inextricably linked, I'll comment on each separately.

Sustainable Development

The *Oceans Act* describes sustainable development in terms that we are familiar with; development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development can only be achieved through collaboration among coastal communities, industry, government, and other interests. A sustainable development process must provide for meaningful,

community involvement, and linked to national and international strategies. By stressing this, the *Oceans Act* recognizes the need for local wisdom to contribute to the global vision.

Integrated Management

The Act requires the Minister of Fisheries and Oceans to lead the development and implementation of a national Oceans Strategy for Canada. The goal of the Strategy will be to guide the development of integrated management plans and to provide for conservation, protection and sustainable use in our estuaries, coastal and marine waters. For too long, we have allowed our actions to be focused sector by sector, interest group by interest group. The nature of this approach has been characterized by conflict. This approach has not worked. We need an integrated collaborative approach because the cumulative effect of many diverse activities in our oceans can have a profound impact on the health of our oceans and the sustainability of our ocean resources.

The Precautionary Approach

The *Oceans Act* emphasizes the need to take a precautionary approach; that is, erring on the side of caution. We cannot afford to take the risk of destroying our oceans' ecosystems forever because we took a gamble today. We cannot continue to use scientific uncertainty or lack of scientific information as excuses for inaction. In fisheries management, for example, if we are going to err, we must err on the side of fish rather than the fishery. For too long we have erred on the side of exploitation. If we truly believe in sustainability, then we must take the necessary action to conserve our oceans resources for future generations.

Ecosystem Approach to Management

The *Oceans Act* also stresses the application of an ecosystem approach to the management of estuarine, coastal and marine waters. An ecosystem approach to management will be the central principle of the Oceans Strategy.

Canada's Oceans Strategy.

The Oceans Strategy, to be developed over the coming months, will focus on the need to increase our knowledge and understanding of oceans and their resources, to improve marine resource management and marine environmental management, to ensure sustainable economic development in coastal areas, and to provide international leadership on ocean issues. It is imperative that the approach taken to develop the Oceans Strategy be inclusive. As Minister Anderson indicated on Sunday, he will soon be establishing a national panel of oceans experts to engage Canadians through consultation and to make recommendations to the Minister on the key elements for an Oceans Strategy. They will meet with concerned groups and individuals in all parts of our country. As part of that process we intend to convene a special youth workshop involving the youth from across Canada.

It is clear already that one of the key elements of an Oceans Strategy must be a commitment to collaboration in developing an integrated approach to coastal and oceans management. Part II of the *Oceans Act* also provides several authorities with measures to conserve and protect the oceans and oceans resources.

Work is now well underway in Canada on three new national initiatives flowing from the *Oceans Act*. They are Marine Protected Areas, measures of and guidelines for, Marine Ecosystem Health, and a national framework for Integrated Coastal Zone Management, all of which are fundamentally linked components necessary to ensure conservation and sustainable use of oceans and oceans resources.

Marine Protected Areas

Increased pressure to exploit oceans resources has increased the conflicts between uses and users. Overexploitation of renewable resources, including numerous fish stocks around the world, including here in Canada, poses significant conservation threats. New kinds of exploitation, such as offshore

energy and mineral development, have brought about new kinds of conflicts at sea. The need to work to protect marine resources and their ecosystems through the establishment of Marine Protected Areas is gaining acceptance and support. Marine Protected Areas are increasingly recognized as a useful tool for coastal and marine biodiversity conservation and protection. They can also form an important part of a broader Integrated Coastal Zone Management program.

Considerable progress has been made in laying the groundwork for this approach in Canada. A national MPA policy has been developed through public consultations and the proposed national framework will be tested through pilot projects, two of which Minister Anderson announced a couple of days ago. More of these pilots will be announced over the coming months. They will test the applicability of different types of Marine Protected Areas under the varying conditions found here on the Pacific coast and on Canada's other coasts. This week, Canada is proud to join the growing list of coastal states that have committed themselves to developing a system of marine protected areas.

Marine Ecosystem Health

There are other threats, posed by increasing stresses on our oceans environments, especially our coastal areas. These stresses come from many sources ranging from more intensive use to land-based sources of pollution. These stresses are resulting in resource depletion, habitat degradation and marine pollution. The *Oceans Act* provides for the development of Marine Ecosystem Health objectives, criteria, guidelines, and regulations. Marine Ecosystem Health refers to physical, chemical and biological measures used to assess the health of marine ecosystems. What we need to measure are not single, isolated parameters, but rather indicators that measure the health of the ecosystem from a holistic perspective.

The development and enforcement of norms to protect marine ecosystem health are key authorities included in the *Oceans Act*. The scientific basis for measures of Marine Ecosystem Health in Canada is currently under development.

Integrated Coastal Zone Management

Another key feature of the *Oceans Act* is its emphasis on a collaborative approach to integrated management. As we have heard at this Conference, Integrated Management is increasingly being developed and used around the world to address coastal zone problems. ICZM is perhaps the most challenging of the issues to be addressed in an Oceans Strategy. To be successful, a national framework for ICZM must have the support of stakeholders, in all jurisdictions affected and must provide for local involvement. The approach to ICZM must be flexible. One size does not fit all.

A successful approach in Canada must build upon a strong support for ICZM. This approach already exists in many coastal communities, and must harness effectively the expertise and support that exists at many levels, including the federal, provincial, territorial, and municipal levels, and among many First Nations. And also at the community and individual level. Economic goals in the past have been pursued without enough care for the impacts upon marine ecosystems. Continuing along that path is not an option

Leadership

The federal government intends to implement the *Oceans Act*, but it does not intend to act in isolation. The government is committed to seeking the advice and input of all Canadians in developing an Oceans Management Strategy that merges national objectives with regional decision-making and that sets national goals based upon local wisdom, needs and desires.

The *Oceans Act* provides the mandate for an Oceans Strategy and some basic authorities to implement the Strategy, but this is only a beginning. Leadership by the federal government is important, but we can only make progress with the collaboration of local leadership, community involvement and a broad-based willingness to pursue a holistic, cross-sectoral, cross-jurisdictional approach to the management of our ocean resources.

Canada has never had a comprehensive, coordinated approach to integrated management of our three oceans and the coastal zones. It's time to lead by example. Our oceans have been one of the most important factors in our history, and they influence us daily as a nation. Both in terms of our interaction with the sea and the coastal zone, but also on a global basis in terms of the oceans role in shaping climate change and global issues. We must build upon that foundation.

Conclusions

The approaches of the past have not been effective. Working together, we now have an opportunity to develop new and better approaches. By working together, we can demonstrate the necessary leadership, commitment and vision and advance the conservation and protection of our oceans, our coastal zones, and their resources. Even though we have much work to do, we're now on the right course. The *Oceans Act* provides us with an opportunity to take a new collective approach. There is a growing groundswell of support at many levels for action. There is a sea-change occurring. Working together we can make it happen.

CLOSING ADDRESS

Miles Richardson
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Greetings to the Songhees and Esquimalt Nations in whose territory we are gathered, to all of the delegates of Coastal Zone Canada '98, good people. I want first of all thank the organizers for giving me the honour of being Conference President. I have received an education over the past four days, and have really enjoyed being amongst all of you learned and committed people from 42 countries. I come before you with humility, and with a great sense of hope for our collective future; with the hope that we have the will and ability to take effective action on the important issues we have put in front of ourselves on relating respectfully and productively with the places that we live, the coastal zone. I'm from a people who since beyond memory have lived on the edge between the undersea world and the sky world at the edge of the forest, what we call today the coastal zone. And my people, the Haida Nation, are one of the nations on this coast of what we call British Columbia, that has seen the densest population in this world of hunter-gatherer people, what was referred to as non-agriculture people. And throughout our history, our people have lived very productively, have lived and developed very rigid and expressive cultures from the richness of our place where we have lived. And I think it is very important, and an opportune place in this beautiful city of Victoria, in the territory of the Esquimalt and Songhees Nation, that we are meeting to turn a corner. To make those changes, to put in place effective action. I am not going to attempt to repeat the eloquent summaries, all the talks and discussions that we have shared. It has been quite awesome to me that we can pull together this amount of knowledge and take it into ourselves and have the opportunity to create useful action. It gives me hope. You give me hope. And I trust that each and everyone of us is going to take the responsibility of the knowledge and the sharing and the love that we have been so privileged to partake in, and do the proper thing with it. To do with it what we know is right. As many speakers have said; it is good to talk, it is good to share information, and we all know that it is not enough. As many speakers, as many First Nations have reminded us, when you have these beliefs and understandings, the challenge is to live them.

I observe and simply note what previous participants in a conference similar to this remind us of. October 1978, right here in Victoria, we had a similar discussion; many of the pieces of information and prescriptions for action were discussed then with enthusiasm. Not much has changed, but then again, there have been some significant changes. To see the youth have such a prominent voice and a prominent place. To see First Nations expressing their views, their perspectives. This is progress. To make thec changes, to live sustainably, to live in an integrated way amongst ourselves, to recognize and respect the places we live, to actually live that knowledge and that wisdom is our challenge. Obviously as speakers have said, there are going to be obstacles. Politics as we have observed, are very much based on self-interest. But that needn't be a huge obstacle, it is not a new revelation to any of us, but we have the knowledge and commitment to transcend that. Ignorance is also a significant obstacle, and we have tools and the ability and the will to educate others about what we have known and what we have learned here.

I will now talk about a perspective, my perspective. I have very much enjoyed hearing yours. Just so you know where this is coming from, I am Kilsli Kaji Sting, it is my Haida name, I am of the Eagle Clan of of the Haida Nation. And the crests I wear are my inheritance, my responsibility. I am also Miles Richardson, my English name and as such am very honoured to be amongst you. I grew up amongst my people just like every other Haida child grows up, much like most other children on this coast. When it came time I had the privilege of going to school, I went to University and got a degree in Economics. I had every intention of getting on with my life in that area, but ended up, a year after I left, fully involved in the political issues of my people. I have spent 15 years of my life working as a spokes-person for the

Haida Nation, pushing the same issues you have heard so eloquently from the First Nations amongst us here. The entitlement, the relationship to place and territory, the imperative of justice amongst all people. Pushing those issues in a very adversarial way, to a world that didn't want to listen. For the last two years I have been working as a commissioner with the British Columbia Treaty Commission. Our role is to facilitate negotiation between First Nations who have lived in, what we now know as British Columbia, since beyond memory, and today's society, British Columbia and Canada. And when we talk about integration, inclusiveness and respect; all those challenges in building modern relations, they are the same challenges that we are putting in front of ourselves here at this conference.

And the obstacles that are in front of us sometimes seem daunting and huge. I know it feels good when amongst like-minded people, we do it so much. We get together and get fired up. We put all these wonderful ideas forward and then go home. We leave, and then much of the time we face these same obstacles on our own. I really hope and pray that one follow up of this gathering is that we stay in touch with each other, and continue to support each other in the vision and objectives that we have laid out in this important area of Integrated Coastal Zone Planning. And I really hope that we continue to support each other. We need each other; and I believe, and felt, and heard that commitment amongst the people who have come here. I pray that we keep that commitment and faith, and bring to fruition the hope that we have started here today.

The youth also reminded us when they came forward and said, "listen to us, we have something to say." They also reminded us that we just can not sit around in meetings and talk about formulas and sterile prescriptions for problem solving. We need to live, to have fun, to meet challenges, to look at these things and experience them from a spiritual dimension. When I got involved in being a leader amongst my people, it was a huge challenge. We decided as a Nation, after banging our head against the political wall with no one paying attention; no one listening; while our homeland was being decimated (all the trees and forest were being cut, the fish weren't coming back, everything was looking bleaker and bleaker). Our people then decided that we are the living generation of an ancient people, we have been here for, scientists gauge about 10,000 years, maybe longer. But our people have survived. Now it really doesn't matter what causes our extinction, there are no excuses. We can't blame other people; we have to take responsibility for ourselves. Our people focused on the real relationship that was important to us and that's our relationship to Haida Gwaii, our homeland and seas. And we said that is what we have to protect, however we can do it.

When I was young man I went to a conference, in Denver, of spiritual leaders that get together to share knowledge and address common challenges. I was in a circle of elders who wanted to hear our story. I was talking and talking; lamenting to them about how tragic it is that our people were loosing our cultural tradition, our language, our songs, our ceremonies; the essential parts of who we are. One of the elders beside me, who I thought was sleeping, looked up at me and says, "Young fellow, those songs, dances, ceremonies and things, haven't gone anywhere. They are in exactly the same place your forefathers found them. They are in the birds, in the trees, in the forest, in the fish, in the four legs. You have just forgotten how to listen. There is one thing I would like you to do before you take another step forward, urge you to remember how to listen. When we talk about spirituality and awareness; with such a truth and simplicity he gave me an awesome message. I thank the youth participants at this conference for reminding me of that, and because it is so important and essential. If we are going to be effective in carrying out our objectives, we must listen. I believe we have the courage and commitment to live that.

When I think back over the course of this conference, the workshops, all of the social gatherings, I have three thoughts that I take away. I remember integration. That we are all in this together. That we all have a place and a voice. Our challenge is to respect that. I remember and think of empowerment. That we are all valuable contributors, and when we talk about collaboration we must talk about true inclusiveness. And very importantly, I think about opportunity. I think about the huge need there is for what we are doing here. The knowledge, the information, put into the hands of people with commitment. But more

importantly, the opportunities for people like us "to walk our talk." When I sit and listen to the Minister, and when I sit and listen to the representatives talk about change, I'm hearing good things, exciting things. I'm also seeing too much political squabbling going on at that level here in British Columbia, Canada, and probably most places around the world. We must keep those elected representatives accountable, we must remind them that the squabbling is not effective, and we are losing the great gift that we have inherited while that is going on. And we must say that clearly and unequivocally to them.

But also, we have a huge responsibility as the people who live in these places, as the people who will be affected by these actions, "to walk our talk." To figure out amongst ourselves what it takes to understand our neighbours. What it takes to know what the needs, values, and principles are that are fundamentally important to others including the rest of creation. And to have the courage and the will to respect those and to work out ways we can coexist, that we can collaborate, that we can integrate on the ground. And from my experience, I know of no government that can stand in the way of true collaboration amongst the people on the ground, and we are equally responsible to collaborate.

Clearly, this conference has talked about local authority and local responsibility. We talked about it in terms of empowerment; we've talk about it in terms of integration. As we address these issues we need to take the opportunities that are in front of us, whether it be coastal zone planning, land use planning, political initiatives, to support and encourage not only local authority, but also local responsibility. When we are talking about local authority and empowerment, we have heard with absolute crystal clarity the need to bring First Nations into the collective process. That First Nations have reminded us that their relationship to place, that their relationship to territory is based on an entitlement, based on an inherent title that comes from being in these places for hundreds of generations. And that if we are going to move forward collaboratively, that needs to be recognized and respected. And I know from talking with many of the First Nations participants here, that they are prepared to meet the challenges that we have collectively put in front of ourselves.

The challenges of articulating in a common useable understandable way, local traditional knowledge that comes from living in a place for countless generations. The knowledge that you can't articulate in formulas or mechanical terms. The knowledge that comes from being there and meeting the imperative of survival for hundreds of years. First Nations are up to that challenge: To put that knowledge and wisdom together with the very important scientific knowledge and understanding that we have come to gain; that is a huge challenge. It is going to take trust, faith and commitment to collaboration. And again it is going to take mutual respect. I believe we are up to the challenge. When you're going to talk about relationships, talk about government to government relationships, each needs to build respect and trust the each other. As another elder reminded us, if we are serious about it, we have to act. If we are honest with ourselves, and really understand, and are in tune with the principles that guide our philosophy and beliefs, then our desires and objectives for sustainability, for respectful coexistence will be met. If you listen and you do what you know is right and correct and true, then what you intend will come about.

That is the opportunity that is in front of us now as Coastal Zone Canada '98 participants, and as people living in our own places in this world. There is a need for the knowledge that we have here: there is an urgent need when you look at the insensitive pressures of globalization that are closing in around us. But that can also be used in other ways; by keeping in touch, sharing knowledge, articulating these values and principles, living experiences, and making sure that these get implemented in our local places. I hope and pray that all of us human beings, in most fundamental sense all Haida means is human beings to distinguish us from other beings, remember the accumulated wisdom of people who have been in the same place, surviving for generation after generation. That wisdom, patience, perseverance and continuing respect, when there are many reasons not to have these characteristics, should be an inspiration for all of us. I pray we keep these in mind, and are guided by them, as we move forward in our lives with our own challenges; keeping in touch and supporting each other.

If we are going to take advantage of the huge opportunities that are in front of us in Canada, in British Columbia (the new *Oceans Act*, commitment to collaboration and inclusiveness) then lets have the institutions that we put in place to implement these commitments reflect our understanding. Lets make these institutions inclusive of the beliefs that we share and are committed to, through recognizing the need for governance and having the Federal, Provincial, and First Nations at the same level.

In close, I leave here with a great sense of hope. I am humbled at the great honour you have given me as Conference President. It has been a wonderful time for me. I have learned so much from your sharing, wisdom and knowledge. Houwa, Thank you.

Coastal Challenge Toolkit

I. Training and Capacity Building

VOLUNTEER DATABASE FOR MOBILIZING NON-PROFIT ORGANIZATIONS

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Short Description and Major Components

A volunteer database would provide non-profit organizations with a starting point when they are considering taking on an environmental restoration project. The information in such a database could include; developing a work plan, evaluation measures, a budget, and a list of necessary resources. The database would provide a list of organizations and individuals willing to donate their time and/or resources to restoration projects. By having access to information and contact with other experienced organizations, groups would be able to find out what processes and tools worked effectively, and what didn't, and help them to avoid repeating the mistakes from other projects. It could be organized geographically for greater ease in locating the needed resources in the group's area.

In summary, the database could include:

- a list of volunteer organizations/individuals (with contact names and information) who have worked on previous restoration projects, including any specific areas of expertise the group/individual has;
- a list of businesses (with contact names and information) willing to donate resources. It is recommended that there be two lists; one for technical resources such as equipment, and one for human resources such as expertise in a particular field;
- examples of previous projects; who did them, what was involved, who assisted, etc. It would also include the location of the project and any contact names and information;
- a list of resources, their estimated value, and any restrictions that might apply; and
- a list of businesses and individuals that work for cash in the restoration field. To be listed in the database, these businesses/individuals would pay an advertising fee that could be used to help cover costs associated with database development and maintenance.

The database could be housed at a web site, allowing maximum access as most non-profit organizations have access to the Internet. By having the database on the Internet, it also means the speed at which users receive updates is increased. Once a site is updated, all users can access this new information immediately.

Who Would the Users Be?

The database would primarily be used by non-profit organizations interested in pursuing environmental restoration projects. It could also be used by businesses and individuals that are looking to donate their resources and/or are looking for ways to link themselves with organizations in their area. Similarly businesses and individuals that are looking to sell their services may also use the database to research possible leads or to compare the value of donated services versus their commercial value.

Uses and Benefits

Recognizing there is an environmental problem is usually the starting point for many non-profit organizations when they are looking to undertake a restoration project. To develop and carry out a restoration plan requires a great deal of time, knowledge, money, and hard work. It is often frustrating for non-profit organizations, which are often struggling with their own lack of resources, to know where

to begin once they decide on a project. A volunteer database would assist groups in every stage of the project, from the planning stages, to the final follow through. Having the information in a centralized location and having it geographically organized would greatly increase the efficiency and speed of the information gathering process, saving fiscal and human resources.

As funding is often a major stumbling block for non-profit organizations, a database could help maximize the amount of available resources and expertise. Some funding organizations require matching funds, including funds in-kind. The greater the amount of in-kind funding a group has often the greater the amount they can request from the funding body. The information in such a database could constitute in-kind funding.

Factors for Success

There are a number of factors that could greatly impact the level of success this type of a database would have. One measure of its success would be the degree of awareness and use by non-profit organizations (the primary reason for developing the database), businesses, and individuals. Success requires a high level of awareness and use. To help determine potential tool usefulness, it would be valuable to do a "needs assessment" to confirm the level of interest and potential users. To acquire this information, a simple survey could be carried out, using a random sample of non-profit organizations.

In order to encourage continued tool use, information must be updated regularly and presented in a clear and easy-to-use format. Users will be discouraged from using the database if it is difficult to navigate through or to find information due to poor layout and structure. In addition, the database needs to be responsive to the needs of its users by including only that information that is required by users. A mechanism providing feedback from users can easily be incorporated into a web site.

Risks and Constraints

One challenge with such a database is ensuring the information is continually updated. It would be valuable to have an individual seeking out new information for the database on a regular basis.

One potential area of failure is the lack of database promotion among the potential users. A marketing strategy would help to ensure that the appropriate users were aware of it. Without some level of promotion, the information may not be used and all the work and effort put into developing the database would be wasted, nor would the revenue source be there to assist with the maintenance of the information.

Even with user fees and advertising fees, there may still not be enough fiscal and human resources available to support the level of maintenance required. A budget is necessary to determine whether the funding and resources for both the development and maintenance exists for a specific period of time. This would involve some degree of revenue prediction. A suggestion is that a portion of the start up costs includes additional fund raising efforts.

Costs and Resources

Many of the costs and resources required to develop and maintain a database have already been mentioned. To summarize, the costs and resources necessary would be for the following:

- initial development;
- survey costs;
- marketing plan development and implementation;
- advertising costs associated with the marketing plan;

- fund raising;
- computing resources;
- database software that is compatible with web publishing;
- web page production software;
- internet access; and
- maintenance (i.e. updating) of the database information;

Additional Sources of Information

The goal of this database would be to provide volunteer and non-profit organizations wanting to do restoration work with as much relevant information, including actual project planning and available resources, as possible. To help achieve this goal, additional sources of information need to be continually sought out. One source of information would be community umbrella volunteer organizations, which would act as a centralized pool of information on the other volunteer organizations in their community. Another source of information would be any NGO's that currently have active databases with the type of information required. Both the Federal and Provincial departments involved in the environment (Environment Canada, Ministry of Environment, Lands and Parks, Department of Fisheries and Oceans, etc.), may also have databases with some of this information. Finally, local libraries usually have directories of all of the non-profit organizations in the province. These directories could also be used as a source for ensuring the database has a complete listing of those volunteer organizations already involved in restoration work.

PUBLIC GUIDANCE MANUAL: A GUIDE TO DISTURBED HABITAT REHABILITATION PROCESS IN THE COASTAL ZONE

Description

This manual would provide a process for interested /or affected groups (government, first peoples, public, NGO's, and industry) that might effectively address the rehabilitation needs of a disturbed habitat. The manual would include three main sections:
1) Introduction: includes a problem statement, goals, objectives, and issues surrounding rehabilitation;
2) Steps involved in process; and
3) Further information and comments.
The main section of the manual would be the steps involved in the process which are:
- Rehabilitation (actual methods not described as all Areas of Interest are variable); and
- Post-rehabilitation-monitoring and trend analysis.

Used By

- public
- coastal community
- goverrment
- First Peoples
- industry
- NGO's

Uses and Benefits

The manual could potentially be used to facilitate the rehabilitation process as instigated primarily by communities:
- application (standard-national use)
- effective communication
- effective implementation
- feedback loops-internal regressive studies
- useable follow-up/stand alone/comparable

Success Factors

- traditional knowledge equally respected
- government-technical/knowledge support
- open database (recommendations, appropriate consultants)
- public involvement throughout process—consistent invitations to meetings
- First Peoples gathering to create connections
- public responsibiity (i.e. funding/more control and involvement with process)
- historical liability (funding provided by responsible (liable) party)

Risk Factors

- scientific uncertainty
- risk of segregation in the absence of integration of communities—include traditional protocols

Costs/Resources

- government
- responsible (liable) parties
- volunteers
- knowledge
- costs–must be necessary and based on needed data/science (provision of free data by communities)

Sources of Information

- Department of Fisheries and Oceans, Habitat Branch
- Environment Canada
- Canadian Wildlife Service
- Geological Survey of Canada
- Ministry of Environmnet, Lands and Parks
- Ministry Aboriginal Affairs
- Ministry of Natural Resources
- Ministry of Forests
- Tribal Council Contact Directory (from Aboriginal Affairs)
- Department of Indian Affairs and Northern Development

Prepared By

Holly Sneddon
Rod Clark

HABITAT RESTORATION RESOURCE CENTRE

Description

A single centre (place) where information of types of restoration programs, their approach, problems, successes, funding, and contacts have been filed.

- searchable electronic database
- geographically referenced (GIS) and structured
- applicable for the Internet
- some capacity to undertake analysis, searchable, interactive
- linked to the world wide web sites pertaining to restoration projects

Used By

- community groups planning to initiate a habitat restoration program in their local area

Uses and Benefits

- communicates successful programs and methods
- facilitates contacts with practitioners
- resource for funders and those that want funds

Success Factors

- a requirement that a restoration program provide their evaluation/ methodology information the centre
- structured and useful database
- user-friendly and have a good look (not intimidating to user)

Risk Factors

- incomplete or inaccurate information
- lack of incentive to provide information
- needs incentive to use the information as part of a restoration planning and design.

Costs/Resources

- requires design and a proto-type
- marketing
- managing the site, maintaining links, up-dating etc.

Sources of Information

- Society of Ecological Restoration (US) Pacific Environmental Research Laboratory

Prepared By

Stafford Reid
David Johnson

INSTITUTIONAL MENTORING

Description

Provide support for:
- education & training
- planning
- auditing
- long-term data set
- supplies

Used By

- all community groups who are collecting data
- private sector institutional support

Uses and Benefits

- benefits are in major components (education, training, etc.)
- institution—longevity of program
- quality assurance
- good for the institution, but essential for the community groups
- more accurate reports

Success Factors

- co-operation of the institution and commitment
- long-term community commitment and initiatives/motivation
- community initiation to convince politicians and institutions
- community groups must be aware of their own power to go to an institution or government for help
- need for a facilitator between community and institutions

Risk Factors

- opposite of the factors for success
- willingness of the community to go into this project
- absence of long term support
- political will
- too much reliance on particular individuals
- too little too late—the degree of problems may be recognized too late

Costs/Resources

- can be very cheap—observational based programs
- time
- costs increase with technical complexity
- training, equipment and maintenance

Sources of Information

- bird Group in Queen Charlotte Islands
- credible sources on the web
- community group networks—local environmental groups

Prepared By

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Howard Edel
Peter Wells
Jarne Molvaer
Concepcion Aredond
Blair Humphrey
Baruch Kimor
Jean Munro
Joe Needoba

MANUAL FOR THE ASSESSMENT MONITORING AND RESTORATION OF COASTAL ZONE HABITATS

Description

- nationally agreed upon standards (using the standardized definition of terms, including the principles of QA/QC
- include sampling, sampling design, designation of habitat

Used By

- Federal/Provincial/Municipal government agencies
- consulting companies
- NGO's
- community groups

Uses and Benefits

- used to disseminate standardized information
- to facilitate a common understanding with respect to manuals, laws, regulation and guidelines when assessing, monitoring, and restoring the coastal zone

Success Factors

- clear, concise, logical progression of steps in any of the methods or technique
- copious illustrations and examples
- repeatability of the user group
- potential pitfalls in methods
- free
- accompanying workshops, training, videos, training certified
- frequent and easy updates
- encompasses user feedback

Risk Factors

- misinterpretation
- personal bias towards definition—personal disagreement
- update training required
- potential to become dated
- technical work

Costs/Resources

- surveys, discussion workgroups
- graphics/typography production
- distribution
- feedback from user groups
- costs associated with training

Sources of Information

- several texts, journals, manuals related to coastal zone management
- government departments

Prepared By

Cynthia Wright
Brian Keating

ADOPTION OF STANDARD METHODS

Description

Comparisons are needed between agencies and between groups. This involves:

- execution—sampling, storage, processing, analysis
- data management
- reference work as a guide to all standardized methodologies–a bibliography with references of standards adopted
- individual guides to specific works
- a general guide to periodic audits
- develop QA/QC—quality reference guides

Used By

- community monitoring groups
- universities
- specialists
- consultants

Uses and Benefits

- easier to integrate comparisons
- allows for spatial and temporal and self comparison
- primary use is education regarding the techniques, and developing new techniques
- guide to data management
- produces reliable data

Success Factors

- that the standard methods do exist
- the precision of the program
- guides to methods translated carefully
- hard copies and electronic copies needed
- inexpensive and accessible (e.g. in university libraries, local specialists and international specialists, community action groups)
- encouraging the standard at a certain level in order to establish it as an international standard
- access to professional organizations

Risk Factors

- reliability/accuracy vs. costs
- reliance on standard methods may constrain new method development
- access to the information—may not be accessible in other countries
- may result in inappropriate method choice
- limitations may not be understood
- need to start with quality rather than quantity and this may be a problem—there are too few practical hands-on workshops
- preparation and preservation of samples
- to little emphasis on the taxonomy and biology

Costs/Resources

- translation
- education
- if analytical sources are not locally available, then guide should suggest external labs that will do the analysis

Sources of Information

- UNESCO
- IOC
- ISO
- OECD
- WHO/PAHO
- Oslo-Paris Commission
- APHA
- EPA
- ASTM
- ICES

Prepared By

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Jean Munro
Jarne Molvaer
Joe Needoba

STEWARDSHIP PROGRAM

Description

A program in which community members volunteer to take care of the common property of the coastal zone. The program is an inventory tool completed by a partnership between government and community users. The government provides the expertise and management of the program. Examples include the Streamkeepers, Reefkeepers and Shorekeepers programs.

Used By

- primary users of a coastal area
- community groups
- government to use results for planning

Uses and Benefits

- creates "buy-in at the ground level"; people care for resources for which they are directly responsible
- increased communication
- more effective planning
- reduce duplication of effort
- conserves and protects natural resources
- creates greater understanding between industry and environment
- provides early warning indicators of environmental degradation
- team-building
- self responsibility—people become responsible for their own actions
- puts "eyes and ears" onto the coastal zone, providing monitoring process

Success Factors

- the program must come from the community, and not be imposed by the government
- cooperation through dialogue
- defining accountability and benefits/costs of non-involvement
- strong leadership/champion both in the community and in government

Risk Factors

- the government has to relinquish some of its power, leading to potential mishandling.
- could create a less-than-level playing field if certain interest groups dominate the group
- volunteer burn-out
- raises expectations of government response
- can result in abrogation of duty
- the transfer of duties out of government can result in a loss of expertise within the government
- legal liability—both on the safety of volunteers and on the quality of data collected.
- lack of volunteers/lack of commitment
- continuity of commitment is unreliable

Costs/Resources

- training of public
- publication of manuals
- liability insurance
- staff—government coordinator, liaison office
- equipment

Sources of Information

- in British Columbia, Streamkeepers, Reefkeepers, Shorekeepers
- Atlantic Coastal Action Program (ACAP)
- community advisors
- watershed stewardship programs in Norway

Prepared By

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Marc Provencher
Pat Dyksterhuis
Leah Gitonga
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Jens Sørensen
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Robert Harrison

WATERBIRD WATCH COLLECTIVE

Description

Community data collection and presentation for waterbirds:
- organized local community around waterbirds which are appreciated and visible to all. About 160 members records observations of birds on a daily, weekly, and monthly basis
- summarize and present information for the community
- organize protection of sensitive habitats including nest sites and intertidal mapping
- fundraising for purchase of property
- education in schools and public talks/workshops

Used By

- community and environmental groups
- government

Uses and Benefits

- develop awareness and pride of community in coastal zone
- local voluntary conservation and protection
- facilitates community commitment to zoning of shorelines for protection
- leads to awareness and pride in coastline

Success Factors

- in-house technical capabilities
- strong leadership
- work with individuals, schools
- communication (local paper, newsletter)
- features to excite and galvanize the community

Risk Factors

- volunteer, therefore based on limited time and resources
- need to keep people enthused (maintain momentum)
- risk of alienating individuals and groups

Costs/Resources

- cost of data entry
- cost for newsletter
- land acquisition for nesting sites
- local technical people to process data (translate common knowledge to technical maps, databases)
- local organizers
- local community members donate time for recording observations and contribute articles/services for fundraising

Sources of Information

Salt Spring Island Waterbird Watch Collective (British Columbia)
Nina Raginsky
Jacky Booth

Prepared By

Jacky Booth

II. Communication and Awareness

MECHANISMS FOR INFORMATION TRANSLATION

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1. Information Management

1.1 Information sources and their constraints

While all stakeholders must be given an equal footing in voicing their concerns and knowledge when planning for Coastal Zone Management (CZM), we should remain careful not to give all sources of information the same weight and each provider the same level of competence. Local understanding of issues is paramount to enlighten decision-making but local populations, like specialists, have their own agendas and limitations. It is therefore essential to be equally critical of all information sources. Information is often more readily accepted when providers are perceived as neutral, as is most often the case when expert/specialist advice isgiven.

Baseline information should be available and accessible. One should be aware of what information already exists to avoid duplicating datasets: relevant information, not simply more information, is paramount. How much data are needed, and its required level of translation, should be evaluated for each situation. Much of the scientific data acquired may be irrelevant to local managers. In many instances, the type of information appropriate for coastal zone management and managers rests several levels removed from the in-depth information used by scientists. Meanwhile, if scientists do not clearly understand managers' needs may provide inappropriately interpreted data.

Managers also need to realise that the types of scientific information scientists can provide at the timescales appropriate for management decisions, may not be as 'hard' or complete as they would like. Increasingly, successful management plans are based on relatively 'soft' scientific information that evolves as our understanding of coastal processes improves. Thus it is important for managers to accept the uncertainty of scientific information and therefore develop management plans that are adaptable to improved scientific understanding or information from other stakeholders. Hence, it is important for managers to see scientific information as predictions rather than facts by encouraging data quality (or credibility) rather than data completeness (i.e. hard facts) from scientists.

Regarding accessibility, information may be difficult to obtain due to data overload (too much data), data licences and confidentiality, legal restriction or inappropriate format. One should aim to remove these technical, financial and/or legal barriers to information sharing and exchange. Translation of information may rest in establishing protocols to curtail these barriers. For example, weather data are commonly used in coastal management, but, may be expensive to acquire for small projects. Financial and/or copyright agreements may be needed between data provider and users in order to facilitate purchase of data at affordable cost, especially if regular up-dating is required. In addition, access to information may be impeded or become difficult due to socio-cultural barriers. Mechanisms may be developed to encourage sharing and translation of local knowledge and know-how.

1.2 Information translation

Information for Coastal Zone Management (CZM) design and implementation is a special case of information handling in environmental management. Before proposing translation mechanisms to make coastal management information more readily understandable, it is appropriate to consider the pathways in information production, management, and use. While some issues may be specific to coastal zones

(e.g. erosion by storm damages, ground-water salinity), and exacerbated by the specific conditions along shorelines (i.e. high population density, multiple uses of resources, and limited space), it is worth exploring if information management on these issues requires specific designs and adapted translation mechanisms.

Information management consists in the successive stages of data acquisition, transformation/translation, distribution and interpretation (by end-users). This information pathway includes feed-back from output (lesson-learned) to ensure that information is up-dated and adapted (Figure 1).

The objective of translation (i.e. information processing) is to ensure that needs/demands (i.e. output) are met: that is, specialized information is translated into "user-friendly material." The user-friendliness of material depends largely on the appropriateness of the translated information for particular end-users whose prior knowledge, perceptions of the issue at stake and context influence their understanding of or willingness to read the information provided.

Language and examples used should be tailored to suit each end-user group so that understandability improves. For example, it might prove useful to ask "How can we make the information relevant or interesting to them"—this will likely vary from group to group. Thus, it is not merely a case of communicating at a level each group will understand (as in the translation of technical material), but also in trying to make the content relevant and interesting to each audience. This latter is a more difficult task and this can be improved if consultation occurs early in the data collection process.

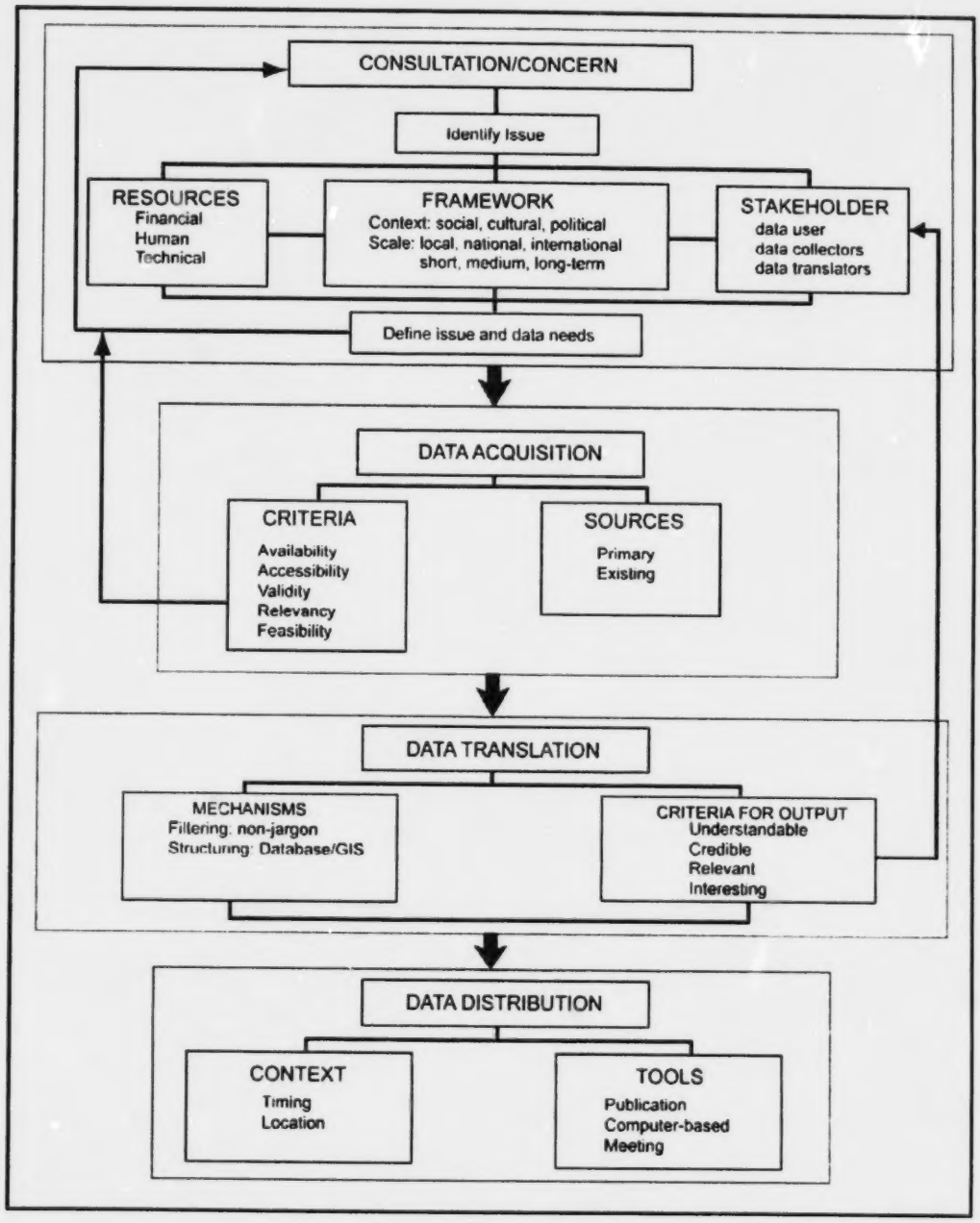
Information processing may serve needs such as; 1) awareness-building, 2) capacity-building, 3) decision-making and 4) environmental monitoring. These needs are based on a socio-cultural, a technico-scientific and/or a politico-administrative agenda depending on the issue(s) at stake. In addition, information translation mechanisms may need to be considered and tailor-made to the successive stages of an ICZM project (i.e. identification of issues, design and implementation) and to the issue or socio-political and cultural contexts/settings at hand. We should define which of these elements (needs, agendas and/or stages) we are considering in the present exercise in order to focus on specific tools.

Information processing may be carried out by two types of participants; specialists (e.g. scientists, lawyers, sociologists) and practitioners (i.e. managers, media). Each group will rely on specific technical capacity, human resources and jargon. Efficacy and capacity for information processing will largely depend on technical, financial and human resources. Technical resources consist, among other things, of computer technology (e.g. GIS/mapping, statistical analysis), but also those related to the measure of anticipated impact of varying management options or decisions already implemented (i.e. assessments via EIA, risk analysis, valuation and cost-benefit studies).

Issues are the corner stone of information management. They decide the range of stakeholders involved, the level of urgency for information, the geographical scale of intervention (local, regional, national, international), the scope of interaction (sectoral, cross-sectoral), accessibility to information, and the purpose of the study (scientific study, pilot project, program development, policy). One should be careful, therefore, that information translation is not data-led but is instead issue-led. In that respect, end-users should be aware of the information they need but also on constraints associated with getting that data. Communication and sharing of knowledge and expectations between providers of information (i.e. translators) and users should be encouraged.

Management often requires inter-disciplinary information that scientists are unaccustomed to providing. The scientific community must increase their efforts to synthesize data into a more holistic picture. Some data lends itself to the development of standardized key variables and scales (e.g. Global Ocean Observing System of UNESCO), but usually it is concerned with large projects at the inter-governmental level and as such it is not relevant for local-level ICZM planning. For example, data catalogues explaining origin, format, contents, etc. of information (i.e. metadata on baseline information) are translation tools for management of large-scale projects.

Figure 1. Stages in information processing for Integrated Coastal Zone Management Processes



Appropriate output must be understandable and credible. While 'understandibility' may be improved by providing information translation appropriate to both the issue and the socio-cultural context of the geographical area under consideration, ensuring data credibility is a much more difficult task. This is largerly due to the contested political, social and economic agendas in decision-making arena where the stakes are high, knowledge is uncertain and decision are typically urgent. Translation tools should help ensure credibility, improve understanding and provide output appropriate for end-users.

2. The Development of a CZM Translation Tool in Practice

2.1 Background

The tool was developed as part of the EU-LIFE project "Implementing Alternative Strategies in Beach and Dune Management: community involvement in sustainable coastal development." The aim of the project is to develop management plans for seven beach and dune systems situated in rural areas of Co. Donegal, in the northwest of Ireland. The approach is multidisciplinary and the project team consists of people with backgrounds in geomorphology, ecology and environmental education. The involvement of local communities in the development of the management plans is an essential feature of the project. In order to facilitate this involvement, a tool was developed to explain the findings of the project to local communities, beach users and other stakeholders at each site.

2.2 The Translation Tool

The tool is an information package consisting of:

- a 6 page colour brochure that explains the general background to the project;
- a 12 page black and white report that outlines the specific findings for one site; and
- a series of 2-4 colour maps and photos of the site, showing features such as habitat cover and shoreline change.

The aim of the package is to provide people with enough information to enable them to decide how their sites should be managed, according to their priorities and beliefs.

Comprehensive studies of the geomorphology, ecology and human utilisation of each site were carried out. These studies gathered data through physical field measurements, observation, questionnaire surveys and informal contact with stakeholders. The collection of primary data gave the project team confidence in the validity and reliability of their findings. It also helped interpret the findings and select the data that had particular relevance to local issues. The project team was aware that they were writing for a lay audience so the language was kept direct and the use of technical terms was minimised. The members of the project team read one another's summaries and were able, as non-specialists, to point out passages that they thought might be too technical.

The reports were carefully written so as not to make recommendations on the main management issues. Instead they describe the range of possible options for dealing with an issue and outline the advantages and disadvantages of each option. For example, the advantages, disadvantages and costs of the options at one of the sites are outlined below. At this site, changing geomorphological conditions have led to an increased rate of dune erosion that is threatening the beach leisure infrastructure. The options include:

Option 1. Armouring the shoreline;

Option 2. Accommodating the change and pursuing managed retreat;

Option 3. Developing a managed beach on the middle cell;

Option 4. Relocating the infrastructure to the southern cell and providing board-walk paths to the middle cell;

Option 5. Discontinuing beach management at the site.

The options range from the extremes of armouring the area to abandoning the site. It is left to the public to express their preferences.

2.3 Discussion

Although the reports take care not to make recommendations, it could be argued that the way in which issues are identified is a subtle way of guiding the public towards the choices desired by those in authority. However, the issues dealt with in the reports were those raised by stakeholders and deemed to be significant by those attending public meetings. One could also argue that the ways in which options are described is a covert form of making recommendations. In order to avoid this, the first half of each report gives objective accounts of the processes that are taking place at the site, in terms of the geomorphology, ecology and human use. It is hoped that a basic understanding of the processes will enable the public to evaluate the different options for themselves.

EDUCATIONAL OUTREACH PROGRAM

Description

- curriculum design related to the concept of ICZM will be developed through various materials
- training workshops on ICZM will be offered to all affected stakeholders

Used By

- coastal local leaders
- government officials
- NGO's

Uses and Benefits

- get more involvement from the communities
- strengthen coastal local

Success Factors

- capable resource persons (trainers)
- funding to develop educational materials

Risk Factors

- traditional customs and values can be the constraints for the applications of the tool
- low absorptive capacity of trainees

Costs/Resources

- time consuming
- continued, adequate funding

Sources of Information

- Train Sea Coast program, United Nations
- ICZM training centres in different countries

Prepared By

Emiliano Ramoran
Bassabong Chaijaroenwatana

GLOSSARY OF TERMS

Description

A list of definitions to overcome misunderstandings and different interpretations of terms related to ICZM, developed through a collaborative process by all stakeholders.The list could include:

- a list of species names (latin names, common names and local names)
- fishing terms and techniques
- recreation terms (e.g.whale watching)
- list of acronyms
- biophysical terms (e.g. nearshore, offshore)
- management terms (e.g. ecosystem management)
- definition of stakeholder
- references (e.g. for more information, contact xyz)

Used By

- anyone who works in or is interested in coastal marine issues.

Uses and Benefits

- everyone at the table speaks the same language
- avoidance of misunderstandings
- aids in the establishment of the ICZM process
- aids agencies in talking to groups
- the process of creating the glossary is very important for building trust
- can be used as a reference during the design and planning process

Success Factors

- the glossary must be designed as a living/growing/changing document (i.e., flexibility must be built into the document)
- must be developed by all stakeholders
- must be simple and understandable
- must be pictoral
- must have the ability to display/use data subsets in various forms for various audiences (e.g., children, seniors, etc.)

Risk Factors

- risk of not being totally inclusive
- risk of being so large that nobody will use/refer to it
- constraint—too large a group developing the glossary could become an unwieldy process

Costs/Resources

- design, writing and graphics presentation
- publishing costs
- distribution system
- follow-up evaluation

Sources of Information

- the stakeholders

Prepared By

Wendy Szaniszlo
Ratana Chuenpagdee
Anja Schulze
Megan Bailiff
George Feltham
Doug Biffard
John Rumble
Suzan Dionne
Will Hall
Ken Morgan
Linda Nichol

PUBLIC AWARENESS EVENT

Description

An event (day or week) tied to a regional or international activity (e.g. low tide day) that focuses attention on the issue of coastal zone management. A coordinator/committee is required to organize/implement the event each year. **Components:**

- guided field trips in coastal areas
- symposia/ workshops/ presentation
- demonstrations (e.g. new sewage treatment design)
- school program (curriculum development)
- questionnaires

Used By

- community NGOs
- youth groups
- community action group
- college/universities
- government agencies

Uses and Benefits

- to engage the public and increase their awareness of issues
- to foster development of solutions
- to educate school kids
- improved public understanding of scientific concepts that may affect their world
- positive method of increasing awareness and fostering involvement– fun, active and engaging

Success Factors

- a spearhead organization at the local, regional, national or international level
- funding (variable depending on impact sought)
- must make it a positive message
- promotion must be broad and well coordinated with local/regional communities (avoid conflicts, etc.)

Risk Factors

- if poorly organized, an event could lead to negative feedback
- difficult to get a spearhead organization, because there are already numerous events taking place
- people may be "tired" of environmental events

Costs/Resources

- local event can be very inexpensive
- a larger event (e.g. national) can lead to greater success but with higher costs (brochures, posters, pins and stickers; location costs; and, organizational costs)

Sources of Information

- Earthday
- British Columbia's Bikeweek (Ministry of Environment, Lands and Parks)

Prepared By

Dan Adamson

STATE OF THE ENVIRONMENT REPORTING

Description

- monitoring of indicators in the marine environment to look for trends over long periods of time
- includes water quality, physical, chemical, biological, and species population information

Used By

- scientists who then must report to managers and decision-makers and public

Uses and Benefits

- possibly anticipate problems before they become very serious
- provides inventory and more information on species

Success Factors

- picking right indicators
- QC/QA
- consistency over time (long periods)
- partnerships with universities

Risk Factors

- must use data meaningfully
- use statistics with care
- if wrong indicators then there is no value
- cost

Costs/Resources

- very expensive
- requires dedication of staff
- if it is not continuous it is not useful

Sources of Information

- Puget Sound Water Quality Authority
- University research centres

Prepared By

Patrick Tremblay
Karen Calla

TEACHER EDUCATION PROGRAMMES

Description

- a series of workshops on habitats and rehabilitation actions aimed at school teachers
- two to three days in length
- include practical exercises appropriate for grade 6-12 levels

Used By

- educational centers
- administrators
- systems for upgrading teachers

Uses and Benefits

- aim at increasing children's awareness of habitat and rehabilitation issues

Success Factors

- wide dissemination of information
- provision of hands-on materials and activities
- support from educational agencies, and government agencies

Risk Factors

- resistance of teachers

Costs/Resources

- professional time and advisors costs
- preparation of materials

Sources of Information

- Continuing Education programmes at universities
- "See-Earth" programme—Acadia University
- "Oceans II" curriculum—Nova Scotia Dept. of Education and Department of Fisheries and Oceans

Prepared By

Beth Bornhold
Graham Daborn

YOUTH BASED EDUCATION NETWORK

Description

Develop a system of volunteers to go into schools and communities, to teach students about the various aspects of habitat destruction and the key activities that cause habitat destruction. In addition, teach about what we know and do not know about habitat destruction and restoration. Encourage students to think about habitat destruction and restoration and get them involved in restoration activities.

Used By

- schools—primary and secondary
- community and youth groups
- educational/nature centers
- camps

Uses and Benefits

- ensures a basic level of environmental awareness
- youth are provided with ways to become more involved in habitat restoration and loss issues and the community groups involved
- youth get a voice in their community and community gets to ensure long-term projects will have support

Success Factors

- teachers who share the same concerns
- hands-on projects for youth and for teachers
- training for teachers
- cooperation of the school boards and administrators

Risk Factors

- resistance from teachers/school boards
- lack of funding
- lack of time in the school curriculum

Costs/Resources

- travel to the schools
- travel to beach/coast/area of concern
- manual/video/other info
- pay a coordinator and have honouraria for "volunteers"

Sources of Information

- Nova Scotia, Canada, Oceans II school curriculum

Prepared By

Beth Bornhold
Graham Daborn

III. Empowerment

COASTAL COACH/MENTOR

Description

- a person who comes from outside the community and live with the community to coach or become a mentor for the local catalysts/ change agents.
- access to outside sources
- skill and knowledge as facilitator and trainer
- accessible by anyone and everyone
- gradually the local catalyst has to take over the role and functions without direct outside assistance

Used By

- local community groups and individual members

Uses and Benefits

- contact a resource person
- assist with access to media
- assisting setting up a physical space and time where people can meet and talk
- local voices can travel far beyond the locality

Success Factors

- money
- commitment of the coach
- coach resides in the community
- access to both the community and sources outside the community
- coach has previous experience which saves time and money

Risk Factors

- whether people in the community accept the coach and would work with her/him
- phase out is critical when the community is ready

Costs/Resources

- personal (lodging, food, transport)
- communication
- voluntary

Sources of Information

- Coastal Marine program NRM
  USAID, Jakarta, Indonesia

Prepared By

Titayanto Pieter

ANALYSIS OF GOODS, SERVICES AND ENERGY USED BY THE COMMUNITY

Description

Administer a simple questionnaire to each household asking where they use their goods and services and how much is spent on each. Prepare an input/output table. Identify the goods and services for which there is a larger outflow of money. Encourage the community to provide these within the community.

Used By

- voluntary agencies/NGO's working with communities promoting the availability of the required goods/services/energy within the community

Uses and Benefits

- keep the money circulating within the community
- lower costs by eliminating the middle man
- find ideas for new eco-friendly products that can be made locally

Success Factors

- collection of reliable data
- design of a simple questionnaire which can be handled by local people/ volunteers

Risk Factors

- data collection and analysis could get too complex to be useful.
- members of the community may not come forward to provide the goods and services

Costs/Resources

- funds needed for the survey and analysis
- credit for setting up new small enterprises by individuals/groups

Sources of Information

Not provided

Prepared By

R. Rajagupalan
Tom Muir

COMMUNITY CENTRE

Description

A multiple use centre in the community, for which the community is responsible. It can be used for public meetings, games and social events. It should include computer facilities, with access to a regional or community database.

Used By

- primarily the community

Uses and Benefits

- non-threatening location; empowers community in meetings, etc.
- team-building
- breaks down barriers
- provides space for training programs
- provides local meeting place to address local issues
- provides storage place for buttons, badges, equipment, etc.
- acts as a symbol of local success

Success Factors

- designed by the community
- suitable, visible, accessible location
- long-term funding commitment.
- staffing (e.g.caretaker, facility manager)

Risk Factors

- government fear of criticism over building a public legacy
- unsustained commitment

Costs/Resources

- land availability
- operation
- design
- staff (both human resource issue and cost issue)
- insurance
- permits/zoning
- furnishings and equipment
- upkeep of database

Sources of Information

- the Fraser River Estuary Management Program (FREMP) is an example of a community centre which had to be rented and not built, and which had a number of consequent relocations
- Denmark has examples of successful coastal resource centres

Prepared By

Mike Warren
Marc Provencher
Pat Dyksterhuis
Leah Gitonga
Steve Samis
Jens Sørensen
Sydney Innis
Robert Harrison

COMMUNITY COOPERATIVE

Description

Generating revenue through eco-tourism:
- tourism office (brochures etc)
- community involvement including specific roles for men (canoe building, bush walking, traditional house building demonstrations) and women (weaving, tapa making, reef walks, telling of oral histories and legends)

Used By

- members of the communtiy

Uses and Benefits

- economic benefits to the community
- less pressure on natural resources
- more control of tourist movement in relation to the resources
- self-sufficiency

Success Factors

- continual flow of tourists
- quality of handicrafts
- pristine environment
- interesting myths and legends
- teamwork between communities/government/NGO's

Risk Factors

- equity problems
- intellectual property rights
- airline restrictions
- threat to traditional values posed by contact with western capitalist culture

Costs/Resources

- seed money for brochures and equipment
- publicity and marketing

Sources of Information

- South Pacific Regional Environment Programme (S.P.R.E.P) PO Box 240, Apia, Samoa, Pacific Islands

Prepared By

Lucille Apis-Overhoff
Naomi Biribo

COMMUNITY DEVELOPMENT QUOTAS

Description

Community networks with input into licenses and quotas. As an alternative to fish quotas and revenue leaving the community, the quotas could have provisions. The community would own the quota and lease to industry and/or resident fishermen. The lease could be used for economic development in community infrastructure, training, marketing. Community quotas that foster a community-based fishery are a possible middle ground between common property and privatized fishery.

Used By

- community groups
- fisher groups

Uses and Benefits

- local access to local resources
- revenues from quota leases stays in communities
- revenues from resource quotas reinvested in communities or in resource through more research or salmon enhancement
- use of quota ownership as equity to raise more capital

Success Factors

- support from senior government for the principles, goals and objectives
- an understanding by fishermen of the benefits of partnership
- consensus or agreement in the community

Risk Factors

- industry sees community competing against them for ownership
- risk of division over allocation issues
- the purchase of a quota prior to the collapse of fisheries would jeopardize investment.

Costs/Resources

- major government loans to purchase quotas
- some regulatory changes

Sources of Information

- shrimp quotas in Newfoundland
- Alaska community development quota in pollock and other fisheries
- B.C. Groundfish Development Authority
- B.C. Aboriginal Fisheries Strategy

Prepared By

Eric Tamm

COMMUNITY LEADERSHIP TRAINING

Description

- 3 week intensive eg conflict resolution, communications, access to government funding etc
- 3 week rotational mentoring (4 sites) Assigned projects/ reports
- paid mentors eg ACAP
- 3 week debrief (report presentation/networking/proposals/ fine tuning for job description)
- prefer resident
- paid position

Used By

- communities representatives

Uses and Benefits

- catalyst for action
- focus on leadership
- continuity
- skill development for community members (capacity building)
- project development
- communication enhancement
- access to funds and programmes
- role models

Success Factors

- leader selection
- commitment by leader and the community
- training and mentoring program
- commitment by government (long-term)
- performance evaluation and possible additional training

Risk Factors

- security of finances
- loss of commitment by leader and or community
- mis-selection of leader
- lack of "buy in" by community

Costs/Resources

Funds to come initially from government but later from multiple sources:

- training programme
- salary for leader
- funds for mentor
- development and delivery costs
- travel and accommodation
- operating funds eg. office, staff etc

Sources of Information

- ACAP
- New Brunswick Sustainable Development sites
- Nova Scotia School of Fisheries
- Huntsman Marine Sciences Centre
- Bamfield Marine Station

Prepared By

Linda Brett
Maggie Paquet
Mike Butler
Claudette Leblanc
Barbara Riley
David Kelly

DEVELOPING A COMMUNITY VISION

Description

- community decides to develop a vision of the community in 10+ years time (broad scope including settlement patterns, demographics, economy, arts, culture, etc.)
- community empowers a group to develop a process and steer the development of the vision (multi-stakeholder, little government)
- steering committee consults the community to identify the issues or themes that must be addressed in the vision (open houses, work shops, open meetings, questionnaires)
- steering committee develops own process (sub-committees for each issue develop goals/objectives, threats, strengths, etc.)
- public input on issue "products" (open house presenting draft results, questionnaires, open meetings)
- develop 2-4 scenarios incorporating a range of ideas/goals/objectives
- then go back to public for input on preferred scenario or alternatives
- important that scenarios are presented in a way public can understand (maps, graphics)
- refine vision based on preferred scenario
- develop action plan to implement

Used By

- process to be initiated by anyone in the community
- planners and managers, politicians, social services, business, community groups.

Uses and Benefits

- helps plan land/water use
- identify whether developments/initiatives are acceptable
- identifies opportunities, creates community pride and awareness.
- gives a sense of direction/touchstone
- reduces conflicts

Success Factors

- local champions
- openness
- inclusiveness
- credibility

Risk Factors

- document won't be accepted/used by decision makers
- lack of participation by a major stakeholder
- consultation burnout

Costs/Resources

In Sidney, British Columbia (pop. 11 000) it cost:

- $25, 000 Cnd.
- 20 dedicated volunteers (stakeholders)
- 1+ champion

The process took 14-18 months to reach a stage of completion.

Sources of Information

- "Agenda 21" processes (on the Internet)
- Mayor Don Amos, Town of Sidney, BC, Canada.
- "Back from the Brink" (video)

Prepared By

Peter Wainwright
Martin Welp
Martin Weinstein

TARGETING DISADVANTAGED GROUPS WHEN DECISION-MAKING

Description

- separate large community to discuss issues (e.g., men from women)
- let separate groups decide what they think about issues
- bring groups back together to report to larger group about the sub-group ideas
- larger discussion to come to more consensus

Used By

Used to empower disadvantaged groups;

- women
- poor
- nonvocal

Uses and Benefits

- improves the number of people empowered to make decisions.

Success Factors

- more people talking
- more ideas coming out into the open
- broader perspectives considered

Risk Factors

- powerful groups not wanting to give power to weaker groups
- may not be appropriate for all communities/countries

Costs/Resources

- time for development of the process
- energy for the long-term

Sources of Information

- Environmental Protection and Community Development in Siphandore Wetland Project, P.O. Box 860, Pakse, Lao PDR

Prepared By

Ian Baird

ECO-FRIENDLY PRODUCTS/PROJECTS

Description

Using existing local resources and skills as income generators. The money brought in from the outside (i.e. eco-tourism in Fiji) or skill and products used to exchange within the community. The aim is to develop products locally that are eco-friendly and to substitute them for imported products or other less friendly products. Also, it is important to develop knowledge-based services to provide more eco-friendly ways of human activity.

Used By

- NGO's to initiate and then draw in others (governments and communities)
- it can be used at a citizen level upwards

Uses and Benefits

- keeps resources local and substitutes less eco-friendly products and practices
- it is a way of managing resources and also generating income at the same time
- income creation, skill creation, diversification of local citizens and increases local knowledge

Success Factors

- local involvement ensures that the users are accountable for the resource and project
- slow down the 'leaks' in the community (ie. the outflow of energy and materials)

Risk Factors

- limited by the physical resources around the community
- also constrained by the market and market saturation
- financial management (i.e. how money is spent)
- community consensus and co-operation (a change of leader may bring negative consequences)

Costs/Resources

- costs involved in accommodating the tourists and in training local people
- start up costs in production of eco-friendly goods

Sources of Information

- World Wildlife Fund-Fiji Office
- SPAGHEE (South Pacific Action Committee for the Environment)

Prepared By

- Aliti Vunisea
- Max Westhead

COMMUNITY-BASED ECONOMIC FORECASTING

Description

Communities need to establish an economic vision, in both the short and long term. This will allow communities to establish their position. Further, it fosters understanding of whether a sustainable community-based economy is wanted or needed. The process requires community input and will provide a basis for economic analysis and economic planning in terms of the goals.

Used By

- all community members
- policy makers on decision making (government/leaders)
- individuals (purchasing/ trading patterns)
- businesses and industry

Uses and Benefits

- will benefit all community members in working towards a collective economic system/goals

Success Factors

- complete community involvement
- adhesion to visions when policies derived
- re-evaluation of goals/successes

Risk Factors

- unifying into a single economic vision may not represent all interests (and thus not be community based)
- people may not want this long-term strategy

Costs/Resources

- community meetings/data compilation
- could result in some positive and negative changes in areas of the current economy
- short term changes could be costly in terms of possible reduction in certain sectors

Sources of Information

- some cities/communities of the world have already completed such tasks (eg Sudbury, Ontario completed a 100 year plan a few years ago)

Prepared By

Scott Pegg

LOCALLY RELEVANT METAPHORS

Description

In Pohnpei, Micronesia, there was a need to communicate a proposed watershed management strategy to community members who had limited education and limited reading ability. An "organizing metaphor" was used to explain the process in terms which were relevant to the people. The traditional Pohnpein homestead was used to describe:

1. Community planning (foundation)
2. Essential partners (4 tall houseposts)
3. Laws, politics for protection (roof)
4. Compatible development strategies (a prosperous garden)
5. Skills and leadership (a growing family)
6. Monitoring (keeping watch)
7. Outreach (sharing with others)

Used By

- used by the community for the community

Uses and Benefits

- explains the objectives and complex planning theory in locally relevant terms.
- a visual image to which the community can relate
- fosters understanding

Success Factors

- locally relevant metaphors can be built.
- don't overwhelm with technical details/terms
- not condescending
- used by and for the community

Risk Factors

- have to adapt to each situation/group.
- seen by some as too simplistic
- possibility of using an irrelevant metaphor

Costs/Resources

- very limited costs and resources
- one creative person's time
- two hours to create

Sources of Information

- C. Dahl. Journal of Ocean and Coastal Management. Vol. 36. Nos 1-3. 1997. (pp. 23-45, especially pp. 30)

Prepared By

Larry Hildebrand

MICROCREDIT AND FUNDING

Description

Village people in rural Bangladesh are organized under small groups. They sit weekly in community centres and deposit weekly savings of around $0.50 US. After 1 year they are eligible for a loan. They have no other access to funds due to poverty.

- The groups have individual accounts. Women are given priority for loans.
- In 20-50 installments the money is given back.
- They use micro credit to enhance their capacity to develop their resources related to farming, boat building, fishery, craft work etc.
- The people are closely monitored and thus cannot purchase other items.

Used By

- rural poor villagers of any country
- it can be replicated here among First Nations

Uses and Benefits

- the rural poors get loans for increasing their living capacity
- the process of receiving loan is very smooth and transparent, quick, and effective
- family income is raised 2-3 times higher and provides a sustainable livelihood
- education, health, and other supports are simultaneously provided
- leads to empowerment, gives a prestigious nature in society

Success Factors

- devoted and honest NGO staff, transparency, and accountability
- involvement of community leaders in the granting of loans
- community members are made responsible for recovery of loans
- little or no institute of bankers in the rural areas

Risk Factors

- problems created by money lenders
- robbery and hijacking
- rural-urban migration
- natural calamities like cyclone and flood

Costs/Resources

- fund from a donor and also some funds are generated through commercial ventures
- skill and honest staff (700) working in communities
- around 12% of the total capital for salary and administration

Sources of Information

- Community Development Center (CODEC)
  House - 621B, RD - 3
  Chandgaon RIA
  Chittagona
  Bangladesh
  Phone - 88-031-671405/670663(W) 618331(r)
  Fax - 88-031-610029

Prepared By

Apurba Krishna

INFORMAL VILLAGE WORKSHOP

Description

- arrive by traditional transport (e.g., boat)
- gifts of catch for chief
- observe/quantitative assessment–state of resource, evidence of method
- village meeting–provide free advice and answer questions that villagers want to know
- villagers determine when meeting is over
- "experts" do not tell villagers what to do
- collect information on traditional methods, knowledge, customs, folklore (recorder)

Used By

In this example, the Vanuatu Cultural Center is doing ethnographic research while developing a co-operative management dialogue/ relationship with coastal communities.

Uses and Benefits

- traditional knowledge is preserved by scientific collection
- scientific knowledge is imparted to the people who might not otherwise be able to obtain it
- broadens peoples' choices and options
- ability to produce information "packages"
- provides resource users with ability to manage their own resources to their own benefit in their own way (i.e. to make the final decision on management

Success Factors

- dialogue—of service by village
- mutual respect—follow traditional protocol
- no pushing of professional agenda
- provide follow up visit's for further support and information access

Risk Factors

- need to respect and protect "proprietary" or confidential information

Costs/Resources

- travel cost
- display costs (e.g. laminated posters in the workshop)

Sources of Information

- Vanuatu Cultural Center,
  Environmental Protection and Community Development in Siphandore Wetland Project, P.O. Box 860, Pakse, Lao PDR

Prepared By

Francis Hickey

IV. Framework and Processes

INTEGRATED COASTAL ZONE MANAGEMENT FRAMEWORKS

Description

What is a Framework?

- A framework provides for the process of addressing coastal issues it is the foundation for addressing them.
- A framework is a kind of methodology, which can be followed regardless of the issues or context. It is comprised of steps that one should follow when doing any kind of CZM.
- A framework is a road map to reach a solution. It should not be a map just for a map's sake.
- A framework provides a basic methodology to apply anywhere at any scale.
- A framework looks at people's interests as well as the physical and economic aspects of the coastal zone.
- A framework provides a foundation—the principles.
- A framework is distinguished by its components and processes.

These notions of framework have been used to develop an ideal model framework for Integrated Coastal Management.

Major Components:

The framework is comprised of seven key elements listed below:

1. The Vision
2. The Goals
3. The Principle
4. Framework Objectives—the Struts of the Framework:
    - Process Objectives;
    - Strategic Objectives;
    - Delivery Objectives.
5. The Glue, which binds all of the above elements together

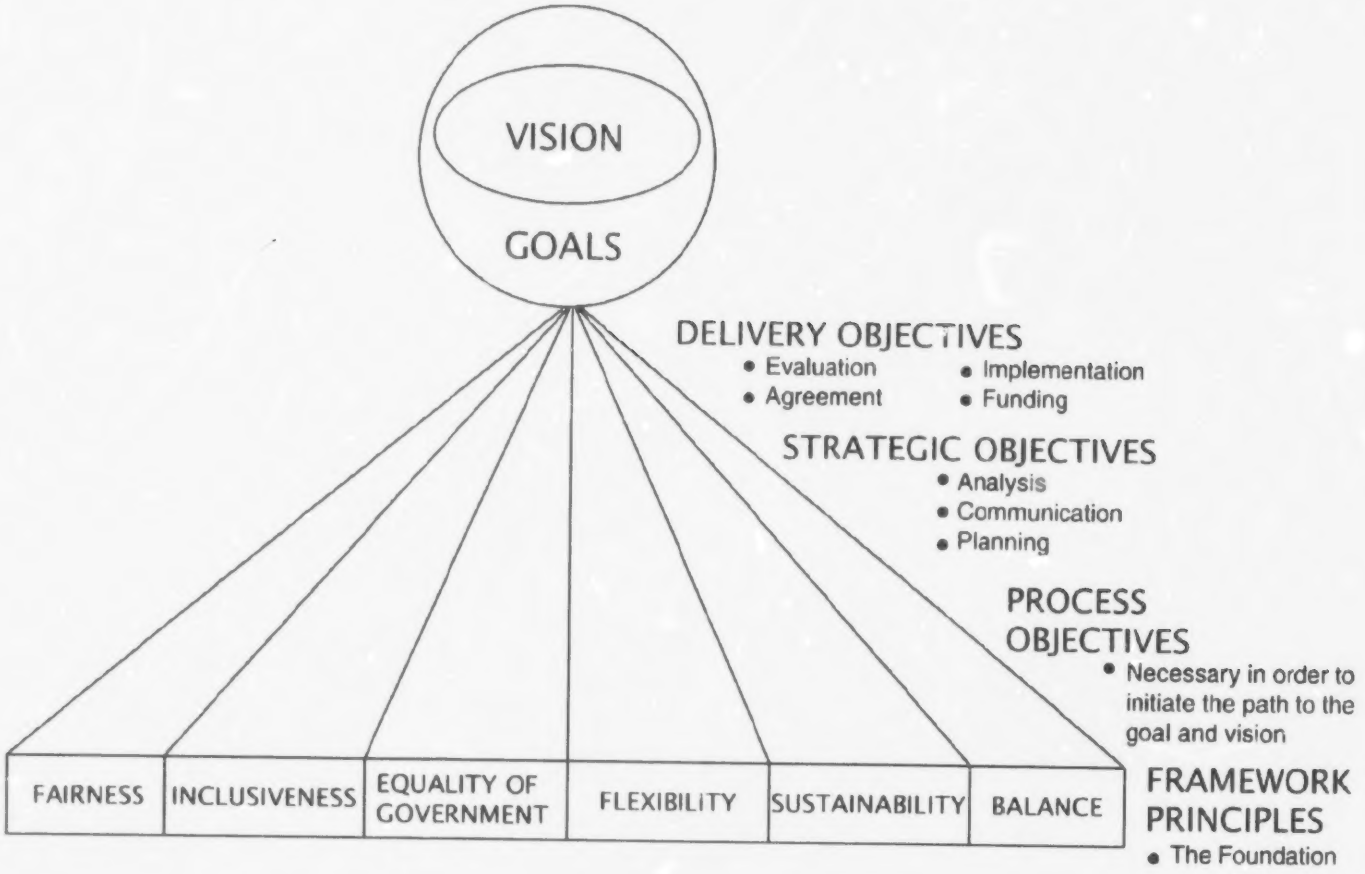
How a framework is defined is sometimes achieved via bilateral or multi-lateral arrangements (Figure 1).

Components of a Common Vision

Sustainability of resources/ecosystems into the future, on various levels and for various purposes, domestically and internationally, for sound sustainable communities, in order to attain/sustain appropriate standards of living for all. Around and within that vision, and intrinsic to the vision, are these elements:

- community harmony;
- listening and hearing;
- honouring treaties and agreements;
- land ownership (as distinct from common property);
- sharing of resources ;

Figure 1. An analytical framework for Integrated Coastal Zone Management



Principles:
The principals form the underpinnings upon which the framework stands. These are:

- First Nations (aboriginal peoples) are an equal partner at the governmental level (equality of governance)
- fairness
- inclusiveness (participation)
- flexibility
- sustainability (of the framework itself)
- balance

Goal(s)
The Goal(s) is/are that target which all else in the framewok is geared to attaining. The goal or goals to be achieved will vary widely in accordance with locale, process sponsorship, vision and mix of participants. The goal in total may never be achieved. However, the intention of the framwork is to enable a steady and organized progression toward it.

Objectives
The objectives constitute the main elements of the framework ,ie those main component items which are to be achieved in order to approach and/or reach the stated goal(s). Routes to these are strategic pathways, within which the programs to be undertaken, at various intervals or on a continuing basis, are the structures and places. Actions and activities of varying intent and duration take place within the program context and recur as required and specified.
Objectives manifest at various levels:

1) Process objectives (need to achieve in order to initiate path to goal)
2) Analytical objectives–analysis, communication, planning etc.
3) Strategic delivery objectives–evaluation, implementation, agreement, funding

Selected ICZM Objectives:

- transfer of decision making authority to the local level;
- support of local responsibility for well being of resources;
- clarify and assure decision making responsibilities; and
- assure and facilitate authority for required actions.

What then are the struts of the framework?
The struts of the framework are comprised of the various strategic objectives that we have identified. These comprise different levels of objectives that we try to obtain on the way to realizing the vision, based on the foundation laid out by the principles. The process objectives are the things which enable the strategic items to take place as one moves through the framework.

What is the glue that keeps the framework together?
This includes the ingredients that give you buy-in; the steps of the components that provide buy-in:

- trust, respect, honesty;
- common vision;
- ownership;
- education—can't have buy in without knowledge and awareness and understanding; and
- participation.

If one of these things is absent, the glue will not stick and the framework risks collapse.

Used By

- governments,
- corporations
- communities,
- societies

Uses and Benefits

- consistency of approaches among agencies, communities, jurisdictions
- focusing of priorities
- coordination of resources and efforts

Success Factors

- adaptability
- flexibility
- using the Framework as a guiding tool
- tracking and inter-relating elements of the program
- inter-agency and inter-jurisdictional cooperation
- adherence to the underpinning principles

Risk Factors

- non buy-in and/or non-participation of one or more key players
- failure to be flexible
- failure to update and adapt
- lack of political commitment to implement
- lack of political commitment to monitor and enforce

Costs/Resources

- strategic planning
- implementation strategies
- implementation: coordination, Delivery, and adaptation.

Sources of Information

- Jonathan P. Secter
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Prepared By

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GENERIC MARINE PROTECTED AREA (MPA) NOMINATION FORM

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Canada V0R 1Z0

Part I

CANDIDATE AREA NAME _____ **AREA #** _____
(official use only)

1. Please circle the number of the Natural Region below that contains your Candidate Area (use Map on page 1 of 'Charting the Course: Towards a Marine Conservaton Areas Act', February, 1997).

Arctic Ocean
- 1.1 Arctic Basin
- 1.2 Beaufort Sea
- 1.3 Arctic Archipelago
- 1.4 Queen Maud Gulf
- 1.5 Lancaster Sound
- 1.6 Baffin Island Shelf
- 1.7 Foxe Basin
- 1.8 Hudson Bay
- 1.9 James Bay

Atlantic Ocean
- 3.1 Hudson Strait
- 3.2 Labrador Shelf
- 3.3 Newfoundland Shelf
- 3.4 North Gulf Shelf
- 3.5 St. Lawrence Estuary
- 3.6 Magdalen Shallows
- 3.7 Laurentian Channel
- 3.8 The Grand Banks
- 3.9 Scotia Shelf
- 3.10 Bay of Fundy

Pacific Ocean
- 2.1 Hecate Strait
- 2.2 Queen Charlotte Strait
- 2.3 Queen Charlotte Sound
- 2.4 Vancouver Island Shelf
- 2.5 Strait of Georgia

Great Lakes
- 4.1 Lake Superior
- 4.2 Georgian Bay
- 4.3 Lake Huron
- 4.4 Lake Erie
- 4.5 Lake Ontario

2. Size of Candidate Area (hectares) _____

3. Latitude _____ Longitude _____
(DD:MM:SS) (DD:MM:SS)

4a. Scale to give detail equivalent of 1: _____

4b. Scale 1: _____ to show detail of small area.

Part II

OBJECTIVES FOR ESTABLISHING MARINE PROTECTED AREAS

(See the MPA Vision on page 11 of the MPA discussion Paper, August, 1998).

Circle the numbers of the following objectives that apply to your Candidate Area. In providing your explainations at the end of each chosen objective, please refer to the determining criteria on page 23 of the MPA Discussion Paper, August, 1998.

Objective 1. To Contribute to the Protection of Marine Biodiversity, a Representative Ecosystem or a Special Natural Feature.

Does your area include one or more of the following? Please circle those that apply:

1.1 Unique coastal inlets, bays, or channels
1.2 Boat havens with important anchorages
1.3 Marine-oriented wilderness areas
1.4 Cultural heritage features
1.5 Critical spawning locations (nurseries or estuaries)
1.6 Species-specific havesting refugia
1.7 Foraging areas for seabird colonies
1.8 Summer feeding and nursery grounds for marine mammals
1.9 Offshore sea mounts or hydrothermal seavents
1.10 Tidal flats
1.11 Offshore banks
1.12 Permanent or seasonal upwelling
1.13 Rare, threatened, or endangered habitat
1.14 Genetic seed banks
1.15 Kelp forests
1.16 Salt marsh
1.17 Polynas
1.18 Special or site-specific feature

Please explain how each of the circled items applies to the objective.
Please append to the application

Objective 2. To Contribute to the Conservation and Protection of Fishery Resources and Their Habitats.

Circule the numbers of the items that apply:

2.1 Provides harvest refugia
2.2 Protects habitats for spawning, juvenile rearing and feeding
2.3 Protects spawning stocks and spawning stock biomass
2.4 Protects areas for species, habitat, and ecosystem restoration and recovery
2.5 Enhances local and regional fish stocks
2.6 Assists in conservation-based fisheries management regimes
2.7 Provides opportunities for scientific research

Please explain how each of the circled items applies to the objective.
Please append to the application

Objective 3. To Contribute to the Protection of Cultural Hertiage Resources and to Encourage Understanding and Appreciation.

Circle the numbers of the items that apply:

3.1 Works of human origin
3.2 Provides evidence of human activity or occupation
3.3 Provides areas with spiritual or cultural value

Please explain
Please append to the application

Objective 4. To Provide Opportunities for Recreation and Tourism

Circle the numbers of the items that apply:

4.1 Supports marine and coastal outdoor recreation and tourism (e.g. diving, marine mammal watching, kayaking, scuba diving, beaches, boat anchorages)
4.2 Supports pursuit of activities of a spiritual or aesthetic nature

Please explain
Please append to the application

Objective 5. To Provide Scientific Research Opportunities and Supports the Sharing of Traditional Knowledge.

Circle the numbers of the items that apply:

5.1 Species population dynamics
5.2 Ecology
5.3 Marine ecosystem structure and function
5.4 Traditional knowledge

Please explain
Please append to the application

Objective 6. To Enhance Efforts for Increased Education and Awareness.

Circle the numbers of the items that apply:

6.1 Affords unique opportunity for public education
6.2 Accessibility
6.3 Demonstrates marine ecological principles and values

Please explain
Please append to the application

Part III

Please append to the application:

1. What zoning, terms, and conditions do you propose for access and use of your Candidate Area?

2. Are Buffer Zones required? Explain.

3. What benefits do you anticipate from having this Area protected?

4. Outline the opportunities you see as a result of having this Area protected.

5. Have you discussed your proposal with any persons, agencies, or groups? If yes, please specify.

6. Groups or agencies that support your nomination (please give name, address, phone and FAX number).

7. How do you envision the management of your Candidate Area?

8. Suggested timetable (are there site-specific issues that should affect or drive the schedule?).

Your Name _____ Email Address: _____

Postal Address _____

_____

_____

Phone No. _____ FAX: _____

Your Signature _____

Date Completed _____

COASTAL HABITAT REGULATION PERMIT GUIDELINES

Description

These procedures would be a guide for taking the right–steps for review or permitting developments that may impact coastal habitats:

- flow chart or procedure steps
- list of agencies to be contacted
- public community information

Used By

- municipalities
- land owners
- First Nations
- communities
- govt. agencies
- private companies

Uses and Benefits

- reduce/eliminate coastal habitat loss and litigation
- identify clear process for development or protection

Success Factors

- acceptance by users for the permitting process
- user-friendly
- includes legal and ownership considerations
- proper public awareness

Risk Factors

- chance to be entangled in treaty negotiations
- lack of community consencence

Costs/Resources

- time
- lead agency to deliver
- costs to inform the users about the existence of the manual

Sources of Information

- local municipalities
- govt. agencies
- First Nations
- NGO's

Prepared By

Lavro Yulio Calliari
Arvid Charlie
Rick Gillie

INITIAL DESIGNATION PROCESS FOR MPAS

Description

There are different ways to designate marine protected areas (e.g., Marine Conservation Area, Ecological Reserve, Park, World Heritage Site). Describes process for regulatory agency(ies) upon receipt of the nomination form:

- nomination form is acknowledged
- initial review to be completed and applicant notified within 90 days
- form circulated to appropriate agencies of principal interest

OR:

- initiates a request for further information
- envisage the review committee as having representation from all of the regulatory authorities plus First Nations
- the review committee evaluates the application and makes recommendations on next steps
- the process could include a liaison person

Used By

- communities
- advocates
- regulatory agencies

Uses and Benefits

- clarifies process for communities and regulatory agencies
- improves communications
- provides guidance to applicant

Success Factors

- requires interagency cooperation.

Risk Factors

- process could take more than 90 days
- extra workload for government agencies
- financial resources of agencies could be a constraint

Costs/Resources

- extra staff time
- training of staff
- extra financial cost to government agencies

Sources of Information

- could be modelled after Fraser Basin Council, British Columbia

Prepared By

Brian MacDonald
Ken Millard
Bev Bullen
Melinda Auerbach
Mike Murray
Bill Austin
Bill Collins

LEGAL INVENTORY

Description	◆ preplanning tool ◆ legal review of all land claims and ownerships ◆ natural resource rights identification ◆ legislation history relevant to the MPA site (Federal or Provincial) ◆ transparency
Used By	◆ any interested or affected party
Uses and Benefits	◆ identify potential use conflicts and jurisdictions ◆ outline feasible boundaries ◆ parties have the same information for equal footing
Success Factors	◆ ability to identify all useful sources of legal information
Risk Factors	◆ litigation ◆ costs ◆ time
Costs/Resources	◆ government legal staff time for research
Sources of Information	◆ Westlaw Legal subscription ◆ internet search (use keywords such as: legal, law)
Prepared By	Lesley MacDougall Mel Moon

MONITORING FRAMEWORKS FOR SCIENCE IN MPAS

Description

Overview of the nature and extent of science conducted for MPAs and how this relates to management objectives and decision-making.

- project and research permit summaries
- funding allocated for research
- stressors
- publication
- instrumentation and monitoring activities
- location and purpose
- evolution of management plans regarding science.

Used By

- government agencies,
- MPA managers (govt., NGO)
- research institutions
- community groups

Uses and Benefits

Its a comparative tool for managers to access whether the objective of preserving ecological integrity is being accomplished.

- provides a succinct summary of scientific activity and partnerships
- provides critical information to managers to set priorities
- a catalyst for sustaining and recruiting research
- an annual reporting tool on the state of science in MPAs

Success Factors

- standardized criteria for comparison
- willingness of MPA managers to participate
- clarity in presentation
- distribution to research community

Risk Factors

- perceptions as an administrative burden
- hesitancy for research results to be compared
- validity of process

Costs/Resources

- minimal travel costs to the MPA (annually)
- data collection cost
- productivity/distribution
- possible restructure of permitting process

Sources of Information

- International Centre for Living Aquatic Resource Management, ICLARM, Philippines

Prepared By

Erin Hannan
Meridith Reeve
Neil Munro

LIAISON FOR ESTABLISHING MARINE PROTECTED AREAS

Description

Person(s) responsible for facilitating the marine protected area process, acting on behalf of communities or groups to represent the nomination to the review committee (refer to template for Initial Process for designation of a marine protected area). Note that the marine protected area process is in lower case and includes all types of designations, ranging from parks to World Heritage Sites, that may be appropriate for protecting marine areas. The liaison person(s) is (are) unbiased, autonomous, arms length, and independent.

Used By

- applicants such as community groups and regulatory agencies

Uses and Benefits

- the liason completes applications
- regulatory agencies are fully briefed
- assists in outlining process for communities and groups
- provides direction towards type of protected area required and the options available

Success Factors

- a commitment from regulatory agencies is required

Risk Factors

- increased community expectations
- workload constraint (e.g. too many applications)

Costs/Resources

- funding may be required from multiple regulatory agencies to provide salaries and expenses

Sources of Information

- review intergovernmental working groups that review designations
- review best management practices around the world regarding liaison role

Prepared By

Brian MacDonald
Ken Millard
Bev Bullen
Melinda Auerbach
Mike Murray
Bill Austin
Bill Collins

MATRIX FOR SELECTION AND EVALUATION OF MPAs (MSE)

Description

MSE is a method for scoring MPAs based on previously defined MPA objectives and criteria. MSE is a way of integrating information gathered in earlier stages of the planning process.

Components:

- MPA objectives
- selection criteria
- scoring matrix
- ranking scale.

Used By

- managers and scientists who have knowledge of the MPA site.

Uses and Benefits

Integrates a wide variety of information:

- allows objective comparison of MPAs
- easily modified template (generic tool)
- clarifies issues
- low tech—can be used in many settings can reveal gaps in knowledge areas
- community involvement from initiation through to management to ongoing access to information

Success Factors

- knowledge of the site
- use in the later stages of MPA selection (i.e. alter steps such as information gathering, legal inventory)

Risk Factors

- not to be used from isolation of other decision-making processes (such as public consultation)
- use in situations where information is insufficient

Costs/Resources

- resources: managers, scientists, information
- costs: salaries, data aquisition

Sources of Information

- Hockey and Branch. 1997. Criteria, objectives and methodology for evaluating MPAs in South Africa: report of marine reserves task group. SANCOR Occasional Report no.2
- email: jmharris@iafrica.com
- John Clarke (ask Jens Sorensen, conference delegate)
- Mike Kaill - San Juan Bottomfish Recovery Program (REEF)

Prepared By

Jean Harris
David Brown

POLICY DEVELOPMENT AND INDIGENOUS LEGISLATION

Description

- indigenous management of own territories
- indigenous peoples making primary and final decisions over their own territories
- impact studies done
- anywhere First Nations are involved

Used By

- all parties
- all levels of government
- NGO's
- developers

Uses and Benefits

- protection/sustainability of habitat utilizing proven sustainable management methods
- balance between traditional knowledge

Success Factors

- need for legal recognition/implementation of proper title and *prima facie* rights

Risk Factors

- need for good communication between government/developers/ and indigenous nations
- need for aboriginal liaison worker between government and communities that is not employed by government

Costs/Resources

- each First Nation Community collect their own data

Sources of Information

Land Use Coordination Office, Ministry of Environment, Lands and Parks, British Columbia

Prepared By

Darlene Mawdsley
Ralph Pegenvanu

PROCEDURES FOR ESTABLISHING A STAKEHOLDER MANAGEMENT GROUP

Description

Procedures for identifying stakeholders, defining their roles and responsibilities, through the development of the MPA and subsequently on an ongoing basis.

Used By

- various community organizations and individuals who are working to promote an area as an MPA

Uses and Benefits

- ensures representation from all interested parties
- the document should be available to everyone via advertising throughout communities

Success Factors

- should be readily understandable by all stakeholders
- should be a broad enough guide to allow for fine tuning to suit the unique needs of communities

Risk Factors

- the document may be misinterpreted as an imposition of rules
- the document could be a waste of time and money

Costs/Resources

- design, writing and graphics presentation
- publishing costs
- distribution system
- follow-up evaluation

Sources of Information

Not provided

Prepared By

Ratan Chuenpagdee
Anja Schulze
John Rumble
Linda Nichol

V. Knowledge

BASELINE STUDIES–HOW TO GUIDES

Description

Before impacts take place, data must be gathered in order to evaluate and monitor changes and impacts.

Components:

- unbiased, independent of proponent
- long-term, accounts for natural variability (temporal)
- selection of key sites (i.e.to act as "weathervane")
- incorporate public/professional opinion and traditional knowledge into selection
- chosen to reduce confounding factors
- replication of sites to ensure accuracy (spatial)
- standardized measurement techniques and methodology
- conformity with monitoring program
- key attributes (species, parameters etc.) should be monitored
- results should be defensible scientifically and in a court of law
- number of measurements should increase with spatial and temporal variability
- goal of baseline data: produce solid and accurate reference

Used By

- community groups under scientific authority
- government regulators
- required by but not undertaken by proponent of development
- court system

Uses and Benefits

- provides clear measurements of impacts and change
- tool for regulation
- warning sign of impacts
- understanding and education of community—about ecology of area and of regulatory process

Success Factors

- manual—should be clearly structured, explicite methods and sampling strategy
- accessible
- simple

Risk Factors

- baseline is not indicative of true environment
- time period may not coincide with level of impacts
- may not be accepted

Costs/Resources

- writing
- publication
- distribution of manual
- costs of baseline study

Sources of Information

- legislated for EIA (Environmental impact assessments) laws
- peer-reviewed scientific literature

Prepared By

Dana Haggarty
Petter Strenstrom
Carl Amos

DATA COMPILATION AND PRESENTATION USING LOCAL KNOWLEDGE AND TRADITIONAL KNOWLEDGE

Description

- compiling background information from lay experts (e.g. aboriginal, land-users, fisherpeople, oral/written traditions)
- compiling available scientific information (hard and soft sciences)
- correlate with an understanding of the factors that drive the society/ communities (e.g.ambitions, values, social attitudes, economics)
- put it into a database format (e.g. GIS)

Used By

- managers
- policy makers
- government
- traditional and local users at any level

Uses and Benefits

- using the understanding of these social 'drives' to formulate a solution strategy (depend on goal/focus)
- it can be adapted for different contexts, different environmental issues, different cultures, and realities

Success Factors

- clearly define a goal and/or purpose.

Risk Factors

- lack of cooperation
- quality of data (e.g. poor quality of data leading to wrong conclusion)
- dealing with different values, interests, opposing interests

Costs/Resources

Costs: money is not a major constraint, though there are administrative and communication costs

Resources: physical hardware (e.g.: computers), software, volunteers

Sources of Information

- scientific literature (including conference proceedings)
- local and traditional knowledge
- NGO's, community groups, government agencies, religious organizations, other organizations
- professional networking

Prepared By

Glynn Gomes
Ray Cranston
Daniela Kalikoski

ENVIRONMENTAL MONITOR

Description

An experienced ecologist is consulted and "on-site" during any field project to ensure the success of the project and to avoid additional impacts caused by a lack of understanding. A list of persons available to assist with habitat orientated projects should be available (government organization, website etc.).

Used By

- volunteer groups
- community organizations
- First Nations
- anyone who wants to enhance, restore, or monitor habitats but lacks experience and specific education

Uses and Benefits

- users would learn from the 'experienced ecologist' and avoid the possibility of inadvertently causing further negative impacts

Success Factors

- project monitors need to have relevant experience
- user groups need to have access to a wide range of 'experts'
- project groups need to have access to a wide range of 'experts'
- project groups would need to take responsibility for their actions

Risk Factors

- experts cost money, user groups may not be able to pay
- user groups may feel that they don't need an "expert"

Costs/Resources

- a database listing "experts" and their fields of expertise would need to be compiled
- experts would need to qualify for the list, based on experience

Sources of Information

- Association of Professional Biologists, British Columbia
- Ministry Environment Lands and Parks, British Columbia
- David Suzuki Foundation

Prepared By

R. Russell
C. Durance
L. Bruin

HABITAT RESTORATION POTENTIAL GIS/DATABASE

Description

A central GIS/database that identifies within a community, region (province) of potential sets/areas for restoration. Information is provided on whether it is a government/community priority, whether design work has been done, etc. Provides contacts for consultants, etc.

Used By

- groups undertaking restoration
- government, in order to set priorities
- local government community planners
- potential funders

Uses and Benefits

- provides a broad "picture" of restoration opportunities, supported by some details on what level of planning/design has been done
- enables potential restorers/funders to make decisions on what effort/ funds can be applied

Success Factors

- user-friendly database/map
- readily accessible (e.g., internet)
- managed
- quality input
- scale (geographically) has to be appropriate

Risk Factors

- wrong scale
- not kept up-to-date
- money for support

Costs/Resources

- needs development and design
- on-going management

Sources of Information

- ESRI (GIS software)
- Canadian and US Wildlife Departments

Prepared By

Stafford Reid

IMPACT ASSESSMENT (POINT-SOURCE POLLUTION)

Description

- evaluation of scientific, social, economic and other multisectoral impacts
- locally and traditionally developed objectives—based on local characteristics

Used By

- local and/or regional authorities

Uses and Benefits

- identifying potential impacts
- establishing of adapted mitigative measures (cancel project option)

Success Factors

- address the relevant points
- appropriate expertise
- regulatory environment

Risk Factors

- completeness, or lack of scope
- not addressing key issues

Costs/Resources

- $500,000 Cdn./year => major projects
- $10,000 Cdn./year => small projects
- user paying

Sources of Information

- various governmental agencies

Prepared By

Abidjah Wachiram
Vassen Kauppaymuthoo
Warren Drinnan

INDICATOR THRESHOLD TOOL FOR THE IDENTIFICATION OF CONTAMINANT SOURCES

Description

Use of a relative importance selection tool:
- sediment chemistry vs. impact threshold => environment health
- fecal coliform vs. impact threshold
- stormwater management

Used By

- local government (municipalities, authorization agencies)

Uses and Benefits

- selection process of high priority storm drain systems
- elimination of environmental stress/negative impacts

Success Factors

- need for relevant impact threshold
- need for locally relevant research
- selection of appropriate sampling sites
- expertise
- analytical support

Risk Factors

- not identifying the representative sites for sampling and missing the problem
- cost and jurisdictional cooperation
- timing

Costs/Resources

- financial (~$100,000 Cdn.)
- technical and scientific support
- human: analytical capability

Sources of Information

- Victoria, British Columbia (Capital Regional District) in use for six years
- Seattle, Washington
- Vancouver, British Columbia

Prepared By

Abidjah Wachiram
Vassen Kauppaymuthoo
Warren Drinnan

INFORMATION (DATA) MANAGEMENT

Description

- comprehensive information management infrastructure
- incorporates TEK (trad. eco. knowledge), anecdotal and scientific
- information may be in a variety of formats: oral, recordings, transcripts, reports, digital databases, graphics, video, photographic
- methodologies, quality/compatibility standards, technological tools

Used By

- researchers
- First Nations
- govt. information managers
- NGOs

Uses and Benefits

- monitoring
- feedback/evaluation of actions/inaction
- comprehensive information access for all
- variety of archive, indexing, analysis, product capabilities
- community involvement from initiation through to management and ongoing access to information

Success Factors

- financial and human resources to initiate the project and maintain within set standards
- continuing community, stakeholder, NGO, govt. commitment and support

Risk Factors

- trust issues, perceptions, attitudes
- anecdotal: not systematic, subjective, political, gaps, community sensitivity, different agendas, confidentiality
- TEK: same as above, plus—cultural and proprietary protocols
- scientific: incompatible methodologies, not comparable, differing scales/resolutions
- misc: difficulties of information sharing, info copyrights, liability concerns, unknown data quality (lack of metadata)

Costs/Resources

- low-cost=community mapping, high cost=GIS, analysis
- digital data management, analysis, output, training, data purchase
- mapping, air photos, satellite imagery

Sources of Information

- Waterbird Watch Collective (Salt Spring Island)
- Rocky Point Monitoring Program
- Marine Life Sanctuary Society (MLSS)
- Canadian Parks and Wilderness Society (CPAWS)
- San Juan Bottomfish Recovery Program (REEF)

Prepared By

Keith Symington
Bob Hansen

METADATA

Description

Metadata: data about data
Includes: Description of accuracy and reliability
- collection methods, who, how, when and where collected
- allows assessment of reliability of data
- descriptions of limitations of study
- identification of spatial and temporal gaps
- definition of meta-data criteria should be explicit

Used By

- scientists
- managers
- consultants

Uses and Benefits

- assists in determining error propagation
- limiting/redesigning sampling
- relative value of data defined (increase/decrease confidence in data)
- fosters precautionary attitude amoung managers
- defines gaps in data

Success Factors

- simple
- should have ranking system (understandable) for data
- accessible
- standardization

Risk Factors

- over-confidence in data
- may miss areas—incomplete database
- higher cost—$ and time
- information overload—important information can be lost

Costs/Resources

- logging procedure more costly—production of database costs
- extra costs for evaluation

Sources of Information

- textbooks and journals on GIS and data management

Prepared By

Dana Haggarty
Petter Stenstrom
Carl Amos

DEVELOPING A NEW FOLKLORE

Description

- translate and use monitoring information into new folklore
- can take any form—oral, written, etc.
- can develop depending what community wants (the appropriate way)
- can be an object

Used By

- community
- community leaders
- external decision makers

Uses and Benefits

- sense of belonging and ownership
- gives an identity
- baseline for new communities
- maintain knowledge base and build on it

Success Factors

- open mindedness
- spirituality/passion

Risk Factors

- within community—different folklore may exist and evolve which causes confrontation
- one common folklore could be dangerous as the knowledge sharing could lead to same people exploiting that knowledge to the detriment of what that folklore represent

Costs/Resources

- the cost of communication (i.e. facilitation, recording)

Sources of Information

- Not provided

Prepared By

Caroline Davis
David Fraser
Liuam Thams
Jose-Lens Cabrera

SUSTAINABLE COAST AND SEAS INDICATORS

Description

Indicators are signposts: is there a movement towards or away from a more sustainable future, and at what speed?

Used By

- ICZM group at any spatial scale

Uses and Benefits

- 15 of the 20 indicators are simple to understand (usually graphical/tabular) statements about trends in coastal sustainability
- indicators can galvanize political support by showing how a region is doing compared to its neighbours.
- identify gaps in knowledge
- indicators help create benchmarks to measure progress towards

Success Factors

- need to create metadatabase
- buy-in by local governments and government agencies
- data is available and it is comparable with other coasts and nations
- prioritize issues/actions.
- base indicators on solid science

Risk Factors

- difficulties of finding data to measure desirable indicators
- can be long gap from one measuring point to another
- some indicators are very data rich or even too scientific

Costs/Resources

- salaries/contract monies to build metadatabase
- long-term implications—monitoring indicators through time
- maintain issues groups
- annual/biennial Coastal Forum

Sources of Information

- basic model by RIJKS (Netherlands) and European Environmental Agency (Copenhagen) but community model evolved first in Seattle
- International Council for Local Environmental Initiatives (Toronto)
- local government training board UK—see various examples
- for coast and marine—Coastlink European Network—at Coastal and Marine Observatory, Waterloo Crescent, Dover, UK

Prepared By

Clive Gilbert

LEARNING ABOUT TRADITIONAL ECOLOGICAL KNOWLEDGE

Description

Teaches students about past, present and future natural resource management issues (many sub-questions in larger areas).

- ask them to take a few weeks to learn answers to questions from elders through independent out-of-class research
- students write essays with their own ideas and elders ideas are integrated
- essays presented to community, teachers, government, peers, etc.

Used By

- formal and non-formal education centres

Uses and Benefits

- teaches traditional knowledge
- gets elders involved in educating next generation
- encourages student learning and independent thought

Success Factors

- good understanding of natural resource management by the community
- traditional knowledge still exists in the community
- elders understand the benefit of the education system for children

Risk Factors

- don't force answers on students before they begin research
- no time in class to introduce exercise—the curriculum must be flexible

Costs/Resources

- time and money for curriculum development
- cooperation of schools, teachers, elders

Sources of Information

Not available

Prepared By

Ian Baird
Vixay Inthaphaisy

VI. Policy and Planning

COASTAL RESOURCE MAPPING FOR ICZM

Description

Combination of scientific information with the local, cultural and traditional ecological knowledge to generate detailed coastal resource mapping. The resultant maps are to be used for the basis and framework for integrated coastal resource planning and management. It is used by the community for the development of action plans. The process creates a common language between community and government partners. It showed a mutual respect for scientific as well as traditional ecological knowledge in the decision making process.

Used By

- community groups
- government
- NGO's
- First Nations
- private sector

Uses and Benefits

- long term planning and community vision for ICZM
- provides a baseline reference for future planning, updating and monitoring
- provides visual representation of resources and their uses
- tool for identification of issues and conflict resolution for coastal land and resource use

Success Factors

- an existing or other type of local group that can implement the action plan
- in order to achieve long term planning in the coastal zone an ongoing group must be in place
- funding and technical support and partnerships with other agencies and local involvement

Risk Factors

- limited access to information gathered by TEK method due to reluctance and mistrust in how the information will used

Costs/Resources

- can vary depending on the output of final product

Sources of Information

- Participatory Methods in Community based Coastal Resource Management, International Institute of Rural Reconstruction

Prepared By

Denise McCullough
Daniel Le Sauteur

TEMPLATE FOR EFFECTIVE MAPPING OF HABITAT

Description

Create a mapping base for which anyone—community, government, or scientist—can portray information about habitat which they have knowledge of.

- have legends using easily identifiable symbols
- use layers of information, to keep it understandable and uncluttered
- potentially compile this into a computer (GIS)

Used By

- local community members
- local governments

Uses and Benefits

- records local knowledge and lore which may be lost over the generations
- record community-based monitoring results
- records traditional temporal information
- the data can be assimilated into other sectors

Success Factors

- information must be accurate in position
- information needs to be clear so that it can be interpreted by professionals and laymen, both familiar and not familiar with the community
- legend must be adaptable to accommodate new types of information

Risk Factors

- assumption that information that is not put on a map means that it has been sampled and not found
- understanding the method of collection of data
- understanding the limitations or constraints of the data so it should not be used beyond its intended purpose
- proprietary information which may be withheld

Costs/Resources

- from: inexpensive reproducible base map
- to: can involve to a geographic information system using computers, computer programs when and if available

Sources of Information

- ES Research institute
- local communities (college and technical institutes)
- mapping agencies (i.e. Natural /resources, Cdn. Hydrographic Service)
- on the world wide web
- provincially: Land Use Coordination Office, Nova Scotia Geomatics Centre, New Brunswick Geographic Information Corporation

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EXOTICS AWARENESS

Description

- brochures, newsletters, WWW (advertising), video
- workshops
- presentation of scientific results
- billboards
- lectures
- interviews with mass media

Used By

- local authorities (e.g. port authorities, conservation groups, NGO's)
- governments

Uses and Benefits

- better information gets to the public
- provides/spreads information on negative impacts of introduced species
- minimize spread of previously introduced species (secondary introductions)
- feedback

Success Factors

- wide distribution of material
- understanding
- feedback

Risk Factors

- funding
- non-effective communication
- lack of understanding
- developing countries may not have sufficient resources

Costs/Resources

- volunteerism (expertise to produce material)
- communication expertise

Sources of Information

- Zebra mussel experience in the Great Lakes

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EXOTICS REGULATIONS

Description
- laws
- policies
- guidelines (voluntary)

Used By
- responsible authorities (federal judges, police, coastguard)

Uses and Benefits
- minimizing/preventing introductions and transplants of exotic species
- maintaining native biodiversity

Success Factors
- enforcement
- control
- compliance

Risk Factors
- international discrepancies in regulations (neighbouring countries)
- regulations need to be applied in a global scale
- penalties for non-compliance must be adequate

Costs/Resources
- sufficient resources (coast guard)
- cooperation between authorities

Sources of Information
- Great Lakes experiences with introduced Zebra mussels
- Canadian transport authority

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LEGISLATIVE FRAMEWORK FOR COMMUNITY APPROVAL OF LAND-USE PLANS

Description

A regulation that requires public participation and approval in coastal zone planning. The plan would include public hearings as an integral part of decision-making process. The legislation must address both land areas and the coastal zone. It should specify accountability.

Used By

- municipal governments
- community groups

Uses and Benefits

- accountability
- provides an integrated aproach to planning process
- planned development and protection
- reduces conflicts between multiple users

Success Factors

- the legislation must be very clear, so as not to conflict with other legislation
- requires public participation
- requires delegation of authority from higher level of government
- requires relinquishing of power from the municipal government to the public

Risk Factors

- does not allow flexibility
- delays action
- complicates the decision making process
- sharing power may be risky
- increases red tape
- local decisions can result in a development-first attitude, specifically with respect to increasing the tax base

Costs/Resources

- legal costs
- enforcement
- must have planning capacity at the local level

Sources of Information

- in many municipalities in the United States the local planning process is required to be consistent with the State Coastal Management Policy (especially. California, Oregon and Massachusetts)
- Norway has legislation of this favour

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POST COMPENSATION, RESTORATION, AND PROTECTION PROJECT MONITORING

Description

- long-term post construction monitoring of all compensation and most restoration projects (very small restoration projects we could use representative examples)
- extend monitoring to at least ten years duration
- all monitoring results will be summarized and shared widely (e.g. the internet)
- both successes and failures must be reported

Used By

- developers
- consultants
- all governments
- community groups that do restoration
- scientists

Uses and Benefits

- allows people to learn from others successes and failures (knowledge)
- reduces risk in undertaking habitat projects–better decisions
- better understanding of habitats
- justifies value of restoration works

Success Factors

- need legal basis to require extensive monitoring
- recommend manual for monitoring for community groups
- people need to have an interest in sharing information
- need access to others information

Risk Factors

- difficulty in making legal basis for extended monitoring
- lack of communication
- difficulty in sharing data

Costs/Resources

- time–summarizing results and distributing information
- manual and training for community groups
- government/science support for community groups

Sources of Information

- Bedford Institute
- Department of Fisheries and Oceans

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RURAL APPRAISAL

Description

Cultural value identification of natural resources by documenting and mapping traditional and modern world land use practices.

Components:

- interview questions
- survey
- mapping
- public meeting with community presentations

Used By

- local government
- First Nations government, community and individuals
- industry
- researchers

Uses and Benefits

- primarily a resource planning/mapping tool
- local management of resource base
- developing a cultural/resource inventory that is based on local knowledge first and scientific knowledge second
- increased education and awareness of communal knowledge and interests
- more effective industry developments (i.e. no blockades)

Success Factors

- community buy-in and participation
- trust between users
- involve community leaders and get their support at the start

Risk Factors

- will not be utilized effectively
- lack of sensitivity in approaching the community could abort the work

Costs/Resources

- travel costs, unless liaison coordinator is resident in the community
- honoraria
- highly technological tools
- office—establishing a resource base
- researchers, interviewers and translators

Sources of Information

- Pronatura, Baja California (Saudiel Ramirez Sanchez)
- internet, library, and gov. agencies
- Canada Health Board

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SOCIOECONOMIC ASSESSMENT OF COMMUNITY

Description

- baseline assessment of socio-economic situation
- record relations between groups
- demographic profile/ baseline studies
- identifying trends
- record of traditions/values/beliefs
- create clear awareness of the context

Used By

- community
- agencies

Uses and Benefits

- will show trend and help the visualize change
- help identify issues of importance

Success Factors

- ability to collect necessary information/data
- willingness for the community to participate
- necessary time allowed

Risk Factors

- time commitment
- funding
- community mistrust over data gathering "what is this being used for"
- agency honesty to community over negitive results from process such as hardships that will result from proposal

Costs/Resources

- time
- program cost

Sources of Information

- Source information availible through Leah Bunce at LBunce@ocean.nos.noaa.gov

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